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ENLISTMENT RESPONSE TO CHANGES IN MONETARY INCENTIVES: IMPROVING THE U.S. ARMY ENLISTMENT INCENTIVE REVIEW AND ALLOCATION PROCESS

THESIS

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AFIT/GOR/ENS/94M-04

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ENLISTMENT RESPONSE TO CHANGES
IN MONETARY INCENTIVES:
IMPROVING THE U.S. ARMY ENLISTMENT
INCENTIVE REVIEW AND ALLOCATION PROCESS

THESIS

Presented to the Faculty of the School of Engineering

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science Operations Research

Chester A. Char, B.S.

Captain, U.S. Army

March, 1994

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Preface

The purpose of this research was to study the process through which the Army assigns monetary enlistment incentives to various military occupational specialties. I intended to estimate the elasticities of enlistment bonuses and investigate the responsiveness of enlistment contracts to changes in Army College Fund allocations. By doing so, I hoped to improve upon the efficiency of the incentive allocation process.

I could not possibly have produced this thesis without the assistance of others. I would like to thank the members of my thesis committee, Dr. Joseph P. Cain and Professor Daniel E. Reynolds, for giving me free reign throughout this endeavor. By allowing such flexibility, I gained full appreciation for the research process. I would also like to thank MAJ John Hershberger, LTC John Szoka, CPT Dan Buning, and Mr. Scott Sanborn of the United States Army Recruiting Command. Their technical insights into the business of recruiting gave me a deeper appreciation of the problem under investigation. I am also indebted to LTC David Mossbarger, Office of the Deputy Chief of Staff for Personnel, for his assistance and recommendations. Finally, I wish to thank my wife Liane, my son Chelstan, and my daughter Chelia. Their love, encouragement, and support carried me through completion of this project.

Chester A. Chan

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Abstract

This research proposes an analytical approach for assessing efficiency and effectiveness of the Army's Enlistment Incentive Review and Allocation Process. In this research, the author applies multiple regression techniques to observations of monthly enlistment contracts for the time period covering October 1987 through July 1993. Bonus contracts, ACF contracts and total contracts were regressed against level of enlistment bonus, availability of the Army College Fund, unemployment rate, and state of U.S. involvement in overseas conflict. The author then used the estimated regression relationships to estimate bonus amounts required to stimulate enlistment and compared performance of true incentive levels against predicted results of regression models. The author then presents insights on the benefits that can be gained by applying elementary analytic techniques to the intuitive allocation process currently practiced by the Army's Enlistment Incentive Review Board.

ENLISTMENT RESPONSE TO CHANGES IN MONETARY INCENTIVES: IMPROVING THE U.S. ARMY ENLISTMENT INCENTIVE REVIEW AND ALLOCATION PROCESS

I. Introduction

1.1 *End of Conscription*

In 1973, all legislation authorizing the drafting of persons into the United States Armed Forces expired. As such, manpower requirements for all military services would henceforth be filled by volunteers from within the American population. In the same year, the United States Army Recruiting Command was restructured to prepare for the challenges that the all-volunteer force would bring. The end of conscription implied that recruiters would now have to compete with other businesses and institutions in hiring persons from the eligible population to fill the ranks of the nation's largest branch of the Armed Forces. In order to attract quality youth, the Army had to show that they were willing to provide pay and benefits equal or superior to those available through civilian employment opportunities.

1.2 *Selling the Army*

In the late 1970's, General Maxwell Thurman, as the Army's Deputy Chief of Staff for Personnel (DCSPER), realized that military recruiting is simply a matter of selling the

Army to qualified youths. In its endeavor to "sell" the Army, the United States Army Recruiting Command is charged with the mission of filling vacancies within critical military occupational specialties by enlisting quality men and women. This mission is essentially twofold: (1) Provide the number of initial term enlistees required to meet Army manpower requirements and (2) ensure the enlistees have the mental aptitude to perform tasks of increasing technical complexity.

The job titles of enlisted soldiers are known as Military Occupational Specialties (MOS). There are over 200 different enlisted jobs in the Army. These jobs are divided into combat arms, combat support, and combat support branches of the Army. Combat arms specialties are those responsible for closing with and destroying enemy forces such as Heavy Antitank Infantryman and Cannon Crewmember. Combat support jobs include Intelligence Analysts and Chemical Operations Specialists. The combat service support branch includes such enlisted jobs as Avionic Mechanics and Army bandsmen. In the recruiting business, a critical MOS is an MOS which left unmanned would hinder a unit's ability to accomplish its mission.

The Recruiting Command's mission also includes the implied task of recruiting quality persons. The Army defines a "quality" person as someone capable of scoring at or above the 50th percentile of the Armed Forces Qualification Test (AFQT). The Army assigns the following codes to test score categories of the AFQT (8:3):

Table 1

Test Score Category	AFQT Percentile Range
I	99-93
II	92-65
IIIA	64-50
IIIB	49-31
IV	30-16

As selling points, recruiters have several incentives, both monetary and nonmonetary, with which to entice quality persons to enlist. Monetary incentives available to Army recruiters are: *Enlistment Bonuses, the Army College Fund (ACF), and the Loan Repayment Program*. A soldier who enlists for an Enlistment bonus receives a cash bonus paid annually throughout his enlistment period. A soldier who enlists for the Army College Fund (ACF) earns money to use toward college expenses providing he successfully completes his term of service. A person who enlists with outstanding debt resulting from college loans can arrange for his loans to be repaid by the Army. Potential recruits must score in test score categories I, II, or IIIA in order to qualify for monetary incentives. The three monetary enlistment incentives are mutually exclusive in that a recruit may select only one incentive option. A recruit may forego any of the monetary enlistment incentives and elect a nonmonetary enlistment incentive such as station of choice or training of choice. This research effort will focus primarily on the monetary enlistment incentives of enlistment bonuses and the Army College Fund.

1.3 *Allocating Monetary Enlistment Incentives*

A substantial amount of the Army's recruiting budget goes toward the payment of Army College Fund and enlistment bonuses. In the 24-month period from January 1986 to December 1987, the Army spent $287.4 million in enlistment incentives (11:2). In 1993, the Army budgeted $8 million for enlistment bonuses alone. In the current year, the Army has budgeted $13 million for enlistment bonuses and $45 million for the Army College Fund. Although seemingly insignificant when compared to 1987 expenditures, these are still substantial portions of the recruiting budget when viewed in light of declining budget dollars.

1.3.1 *Congressional Authorizations.* As recruiting tools, enlistment bonuses and ACF were designed to draw volunteers into Military Occupational Specialties (MOS) which, for some reason or other, were less desirable and difficult to fill to required manning levels. In terms of an enlistment bonus, congress has empowered the Army to offer a bonus as follows:

> . . . a person who enlists in an armed force for a period of at least four years in a skill designated as critical . . . may be paid a bonus in an amount prescribed by the appropriate Secretary, but not more than $8,000 (24:868).

Determination of critical specialties is left to the discretion of the Secretary of Defense.

The Army College Fund are educational assistance funds above those an enlistee could receive through the Montgomery G.I. Bill. Congressional authorization for additional education benefits, in the form of the Army College

Fund, is as follows:

> In the case of an individual who has a skill or specialty . . . in which there is a critical shortage of personnel or for which it is difficult to recruit, the Secretary concerned . . . may increase the rate of the basic educational assistance allowance applicable to such individual to such rate in excess of the rate [of basic educational assistance] as the Secretary of Defense considers appropriate, but the amount of any such increase may not exceed $400 per month, in the case of an individual who first became a member of the Armed Forces before November 29, 1989, or $700 per month, in the case of an individual who first became a member of the Armed Forces on or after that date (25:259).

Prior to April 1993, new recruits could obtain ACF dollars as follows: 8K for a 2-year enlistment, 12K for a 3-year enlistment, and 14.4K for a 4-year enlistment. On April 1, 1993, Congressional authorization increased ACF dollars to 15K for a 2-year enlistment, 25K for a 3-year enlistment, and 30K for a 4-year enlistment. Therefore, under the Army College Fund, a new soldier can receive up to $30,000 for college if he is able to complete his enlistment. Both the enlistment bonus and the Army College Fund would appear to be worthy incentives for young people beginning to enter the adult work force.

1.3.2 *Current Allocation Process*. Through the budgeting process, dollars are allocated separately for the enlistment bonus and the Army College Fund. For fiscal year 1994, the Army has budgeted $13 million for enlistment bonuses and $45 million for the Army College Fund (14). The current trend is that fewer dollars are being allocated to monetary incentives each year.

Although the rationale for assignment of enlistment bonuses and Army College Fund dollars toward specific MOS's is rather simple, ie. offer incentives to specialties which

need more people, Sanborn, an analyst with Recruiting Command claims that "there is no scientific methodology for assigning bonus dollars or ACF monies" (19). Recommendations as to which specialties receive incentives and the associated dollar amounts of those incentives is the responsibility of the Enlistment Incentive Review Board. The board is comprised of military and civilian representatives of Recruiting Command, the Office of the Deputy Chief of Staff for Personnel, and U.S. Total Army Personnel Command. Approval authority for monetary incentives rests with the Deputy Chief of Staff for Personnel (DCSPER).

The Incentive Review Board convenes quarterly. During the review process, each critical MOS is discussed and incentives are applied based on the *criticality* of the MOS. The board deems an MOS critical if its current fill rate is below that of the Army average. Current fill rate is determined as the number of available slots filled divided by the number of training slots allocated for a given MOS.

$$\text{fill rate} = \frac{\text{training slots available}}{\text{training slot allocated}} \qquad 1.1$$

Once deemed critical, the board then decides on the amount of incentive to apply. For example, if a particular MOS already has an associated bonus of $5,000 but is still below the Army average fill rate, the board may decide to offer a $6,000 bonus for that MOS. Likewise, they may offer the Army College Fund option for that MOS. The board proceeds in this manner, increasing incentives for all of the critically short MOS's. Similarly, the board also decides on removal of incentives from specialties which may have been critical in the previous quarter but have since then been filled to or in excess of

the Army average. Once approved, the new levels of incentives are available to the recruiters who, in turn, use these adjusted incentives in their quest to enlist quality persons. As described, the adjustments made during the process are based totally on intuition and experience (14).

1.4 *Measures of Responsiveness*

Through the incentive review process, the board members adjust incentive levels in an effort to increase the number of persons signing for particular occupational specialties. Their intuitive process is based on the assumption that there is a positive relationship between the monetary incentives and the number of potential recruits that sign recruiting contracts.

In my research, I intend to apply principles of mathematical modeling to estimate the relationships between the number of people that sign recruiting contracts and the monetary incentives. I will also study the impact of other economic indicators, such as unemployment, on recruiting contracts. Since enlistment bonuses can assume any value from zero to 8000 dollars, I will examine elasticities. For a particular MOS, the board can either offer the Army College Fund option or not. Because of the binary nature of the ACF enlistment option, I will investigate the change in the mean number of contracts signed as the application of the ACF option change.

1.4.1 *Application of Elasticities.* Elasticities are a measure of responsiveness in an economic system. Elasticity is defined as the percent change of one variable relative to the percent change in another variable when all other factors of the system or process

remain constant. Given the following relationship,

$$Y = f\,(X_1, X_2, \ldots X_p) \tag{1.2}$$

an elasticity is defined as follows:

$$e_{Y,X_1} = \frac{\text{percent change in } Y}{\text{percent change in } X_1} = \frac{\dfrac{\Delta Y}{Y}}{\dfrac{\Delta X_1}{X_1}} = \frac{\delta Y}{\delta X_1} * \frac{X_1}{Y} \tag{1.3}$$

The above expression shows the response of Y, *ceteris paribus*, to a 1 percent change in variable X1 (16:188).

One may ask the question, "How will knowing the elasticities increase the efficiency of the incentive review process?" Deriving the elasticities will provide the incentive review board with a measure of how much of a change in bonus they should apply in order to bring about the desired increase in the level of recruiting contracts. For example, if the elasticity of Infantry contracts with respect to enlistment bonus is determined to be:

$$e_{Y,X_1} = \frac{\%\Delta \text{ Infantry Contracts}}{\%\Delta \text{ Enlistment Bonus}} = 5 \tag{1.4}$$

the board could apply a one-percent increase of the enlistment bonus if the desired outcome was a five-percent increase in Infantry contracts. If they increased the bonus by more than one-percent, the result is expected to be an increase of Infantry contracts in excess of their target. Namely, more than five-percent. The application of elasticities results in a method for deciding incentive levels without "overestimating" the required

increase in bonus dollars.

On the other hand, this study will also reveal if no relationship exists between the number of enlistment contracts of a specific MOS and level of enlistment bonus. In this case, members of the incentive review board can apply their understanding of the relationship and focus on changes in other factors, such as ACF, which may impact on changes in the number of contracts. In effect, they can save time by avoiding debates over proposed increases that would be ineffective. In terms of monetary efficiency, a discovery of a lack of relationship between contracts and enlistment bonuses implies that bonus dollars could be applied toward other skills that are affected by fluctuations of bonus levels. This, in turn, means that dollars allocated for enlistment bonuses of a non-responsive MOS can be allocated elsewhere. This should result in overall savings of recruiting dollars.

1.4.2 *Differences in Mean Response*. With respect to a specific MOS, the incentive review board can either allow or disallow the offer of ACF as an incentive. If the Army College Fund is effective in drawing recruits to a particular MOS, we should expect a high number of contracts signed when ACF is offered relative to the number of people enlisting in that MOS during periods when ACF is not offered. As an example, suppose the following relationship exists:

$$E[Y] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \qquad 1.5$$

where Y is the number of Infantry contracts signed in a month, X_1 is the level of enlistment bonus, and X_2 is an indicator variable (X_1=1 if ACF option available, X_1=0 if

ACF option not available). β_0, β_1, and β_2 are parameters of the response function. When the ACF option is not offered, β_2=0 and equation 1.5 becomes:

$$E[Y] = \beta_0 + \beta_1 X_1 \qquad 1.6$$

The mean response, measured when X_1=0, is β_0. When the ACF option is offered, β_2=1, and equation 1.5 can be rewritten as:

$$E[Y] = (\beta_0 + \beta_2) + \beta_1 X_1 \qquad 1.7$$

In this case, the mean response is $\beta_0+\beta_2$. This effect is illustrated in the following graph:

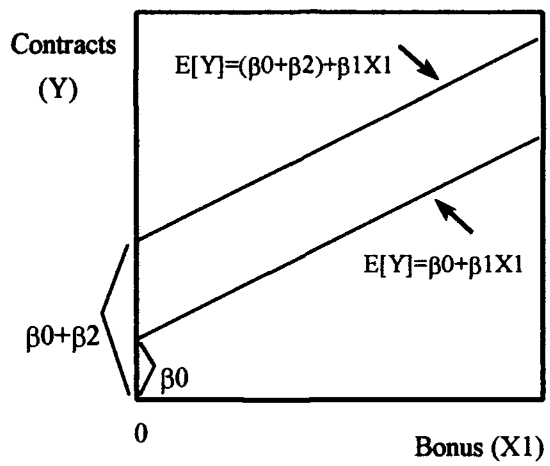

Figure 1.1

Figure1.1 shows an increase in mean response for all levels of X_1. This implies that if ACF is effective, we can expect more contracts signed when ACF is offered than when it is not offered.

As with the elasticities of enlistment bonuses, examination of the differential effect of the Army College Fund will aid the decision making process of the incentive review board. If the expected increase in mean response is sufficient to meet required fill level of an MOS, the board can offer the Army College Fund without commitment of bonus dollars. Likewise, if an MOS is unresponsive to offers of ACF, the board could focus on other incentives.

1.5 *Research Objectives*

The current incentive allocation process, based entirely on intuition and experience, has its merits in that it has thus far enabled the Army to meet recruitment goals. Its lack of a rigorous scientific foundation, however, may imply that it is economically inefficient in its current state. The fact that their method allows for mission accomplishment and fulfillment of entry-level manpower needs certainly indicates that the levels of incentives have been sufficient in attracting young people to the military. This same fact, however, also leaves the following question unanswered: Has the Army spent too much in terms of monetary enlistment incentives? In a 1986 study, Morey and others claim that the Army knew they were not spending recruiting dollars efficiently and were overpaying new recruits in terms of monetary incentives (11:27), and in a separate report, Morey concluded that ". . . there is still a need for analytical and defensible rationale in the awarding of monetary enlistment incentives" (13:3).

Through this research effort, I intend to accomplish the following objectives:

1. Examine the relationships between the number of contracts signed and levels of monetary incentives in order to estimate elasticities of enlistment bonuses.

2. Examine changes in mean response resulting from application of the Army College Fund in order to determine effectiveness of ACF as an enlistment incentive.

3. Provide scientific justification for the allocation of enlistment bonuses and assignment of the Army College Fund to specific military occupational specialties in order to increase the efficiency of the Incentive Review process.

4. Provide additional insights to recruiters in the field.

1.6 *Limitations of Research Effort*

I do not intend to develop a complete cost model of the Army Recruiting process. I do not pretend to have a fully comprehensive understanding of the complexities of the recruiting environment. I only intend to develop a tool with which the members of the Incentive Review Board may base their recommendations when adjusting the allocation of monetary enlistment incentives.

II. Literature Review

2.1 *Introduction*

Since the evolution of the all-volunteer force, the Army has conducted several studies of the Army Recruiting process. Some researchers have discussed the conditions of the recruiting environment which impact on the efforts of recruiters. Some research efforts have focused on behavior and motivation of the potential recruit's decision process. Other studies have attempted to develop cost optimization models of the entire recruiting process. There are a multitude of factors which impact upon the success of U.S. Army Recruiting Command.

2.2 *Attractiveness of the Army*

Prior to the demise of the Soviet Union, the United States' need for a large standing military force ensured job security for members of the Army. Since then, however, the end of a Soviet threat has also meant an end of job security for U.S. soldiers. In a study focused primarily on the cost of quality recruits, Thomas provided many insights concerning the current recruiting environment. Thomas noted that ". . . the daily barrage of news about base closures and reductions of our forces evokes an image of a military unable to provide stable career opportunities" (23:10). This implies that recruiters will have more difficulty convincing potential recruits of opportunities in the Army.

In addition to changes in the military, improvements in the national economy is also impacting upon the recruiting environment. Increasing National product and declining

unemployment may mean increasing opportunities for today's youth outside of military service. Again, youth are being drawn away from military service.

The other factor affecting the recruiting environment is the involvement of the U.S. military overseas. During the 1980's, the brief military conflicts in Grenada and Panama did not deter young persons from joining the Army. Recent operations such as Desert Storm and peacekeeping in Somalia, however, may be affecting the perceptions of potential recruits. Thomas noted that potential recruits and their parents are realizing the risks involved in military service which could impact upon the Army's attractiveness as an occupation (23:10). Cutbacks in the Army, improvements in the economy, and risks overseas all lead to decreasing attractiveness of the Army. These conditions highlight the importance of the role which incentives play in attracting prospective recruits.

2.3 *The Enlistment Decision*

Researchers which have studied the motivation behind a person's decision to join the Army have found that people join the Army for a variety of reasons. Pliske and others state that some of the reasons for enlisting in the Army are self-improvement, economic advancement, military service, time out, travel, and education money (18:vii). The primary reasons, however, are education money and economic advancement.

All studies conclude that monetary incentives rank high amongst reasons for enlisting. To offer a working perspective of what the young recruits are looking for, Sergeant First Class Simpson, station commander of the Army Recruiting Center in Kettering, Ohio, reveals that:

> Eighty percent of the kids that walk through the doors are looking for money. The rest of them are running from something. Of the kids looking for money, most of them want money for college. The ones running do not qualify for incentives. So in my view, the Army College Fund is the biggest attraction for today's young people. No one enlists anymore out of a sense of service to the nation (21).

Sergeant Simpson's view is confirmed in a study conducted by Jorgensen and Ross. Through surveys of enlistees, they have found that education benefits rank above job security in a person's employment search process (7:4). Elig and others have also discovered that "[opportunities] for skill training [are less important than] money to attend college [or] an escape from unemployment..." (3:vii). This leads me to believe that my research should indicate greater responsiveness of new recruits to increases in the Army College Fund relative to increases in enlistment bonuses.

Other studies, however, do not totally disregard enlistment bonuses as an effective recruiting tool. The Pliske study does indicate that bonuses do attract potential recruits, and research by Gray has shown that ". . . bonuses may be cost effective incentives for those who are not interested in further education" (4:104). These previous findings suggest that I should also see a positive relationship between the number of recruits and increases in enlistment bonuses.

Another factor which is probably active in the recruiting decision is the potential recruit's perception of unemployment. Current economic conditions is a factor which usually influence the parents and high school guidance counsellors of potential recruits, who in turn are very influential in a young person's decision to enlist (10). Economic factors, whether they are money for college, money for short term economic

advancement, or poor prospects in the local job market, are forces which impact on the enlistment decision.

2.4 *Existing Models*

2.4.1 *Morey Model.* In line with General Thurman's comment of recruiting being the business of selling the Army an analyst at Recruiting Command elaborated on the remark and stated that as a business, recruiting should attempt to operate at minimal cost (6). In 1989, Morey Consultants developed a model which they claimed measures the total incentive cost of recruiting as a function of the number of enlistees in a given period, the average price of an Enlisted Bonus Option, the weighted price of the Army college Fund option, unemployment, and other non-monetary factors (11:38-39). They use their model to estimate price elasticities of the monetary incentives, and are able to examine relationships in the marginal changes of total incentive costs as ACF or enlistment bonuses change (11:28-35). Their translog regression approach is analytically sound and their results are directly applicable in the overall budget process of determining dollars needed to meet recruiting goals. Their estimated elasticities, however, measure changes in recruiting cost incident to changes in monetary incentives. The Incentive Review Board needs elasticities which reflect changes in the number of recruits relative to changes in the incentives. Through their analysis, Morey and his associates developed an unconstrained cost model which enables them to identify over spending (11:27) and although useful from the standpoint of estimating monetary waste (11:49), can not be applied by the Incentive Review Board when adjusting monetary

incentives on a quarterly basis. The Morey Model fails to satisfy the Incentive Review Board's need for an analytical tool which provides an analytical and defensible rationale for allocating incentives.

2.4.2 *The SRA Model.* In 1990, the Systems Research and Applications (SRA) Corporation and Economics Research Laboratory also developed a cost model of Army recruiting. The SRA model differs from the Morey model in that the SRA model only considers the cost-effectiveness of the Army college Fund. In their analysis, SRA measured the impact upon the number of recruits resulting from changes in the Army College Fund (22:16). The study concluded that the Army College Fund is a cost-effective force-manning tool (22:20). Again, not a useful result for the Incentive Review Board.

Another factor impacting on the applicability of the SRA results is the data set used to derive their estimates of elasticities. The SRA study incorporated recruiting data collected from fiscal year 1981 through fiscal year 1989. A significant change to recruiting policy, known as *delinkage*, was implemented by congress in December 1985 (12:2). Prior to December 1985, soldiers could enlist for both an enlistment bonus and the Army College Fund. Delinkage eliminated the enlistment option of receiving both a bonus and ACF. In light of the delinkage policy, the SRA study incorporates enlistment incentive data which is derived from differing conditions. In effect, they have performed statistical analysis on sample data obtained from different populations, and therefore, their findings are suspect. As with the Morey study, the SRA results cannot be applied to the decision process of the Incentive Review Board.

2.5 *Conclusions*

Changes in the recruiting environment highlight the Army's need for incentives to attract potential recruits to the Army. Many of the published reports indicate that the best means of attracting potential recruits is by offers of monetary enlistment incentives. Although studies have touched on the cost-effectiveness of monetary incentives, no research has specifically addressed the analytical needs of the Incentive Review Board. Through my research effort, I intend to provide an analytical tool to assist them in the process of allocating monetary enlistment incentives.

III. Model Formulation

3.1 *Assumptions of Classical Economics*

In order to determine the relationships between the number of contracts signed for a specific MOS and the levels of monetary incentives associated with that MOS, we must first develop a model to represent the behavior of the process under study. As representations of real-world phenomena, all models inherently possess assumptions in order to reduce the problem in question to a manageable level. Some assumptions which apply in the study of the enlistment process can be found in the theory of classical economics. Taken from what are formally known as the Axioms of Rational Choice (2), two of these assumptions are apparent in the decision making process of potential recruits.

The first applicable assumption is that of *substitution*. The axiom of substitution states that "a person is willing to sacrifice some of any economic good to obtain more of other economic goods. Economic goods can be physical or non-physical" (2). I will apply this axiom by assuming that for some individuals, their major goal in life is to attend college. Either due to non-availability of funds within the family or disqualification from tuition assistance programs, these individuals turn to the Army as a means of earning money for college. If a potential recruit desires to go to college, he must be willing to sacrifice the time he commits to the Army now in order to obtain the opportunity to attend college at a later date. Somewhere in his decision process, he rationalizes the sacrifice.

The second applicable axiom states that "not all people have identical preference patterns (2)". Some potential recruits are not interested in further education and view the Army as a potential career, while others may value travel and opportunities for adventure over any increase in economic standing. These two assumptions may explain patterns in the relationships between contracts signed and levels of monetary incentives for various military occupational specialties.

3.2 *Data Collection and Preparation*

In order to study the relationships between the number of contracts signed and monetary incentive levels for a particular MOS, I obtained observational data from the Program Analysis and Evaluation Directorate of the United States Army Recruiting Command (6). The data consisted of records of all persons who signed enlistment contracts between October 1987 through July 1993. These records are contained in their Minimaster Automated Database. Because only potential recruits who score above the 50th percentile on the AFQT are eligible for monetary incentives, I eliminated all non-quality persons from the data base. Applying my assumptions, I believe that there are two distinct populations involved in the enlistment process: (1) college-bound recruits and (2) career-oriented recruits. Therefore, I further refined the data into the number of persons opting for the Army College Fund and persons enlisting with an enlistment bonus. I used this information to compute the number of persons contracting, by monetary incentive type, for a particular MOS during a given month. This resulted in 70 observations for each MOS under investigation.

In keeping with previous researchers, I obtained data pertaining to levels of enlistment bonuses, levels of Army College Fund, and unemployment. I extracted levels of enlistment bonuses and Army College Fund from Incentive Messages provided by Recruiting Command. Data for enlistment bonuses were given to me in dollars. For the Army College Fund, I noted the level of college fund applicable to an MOS for the given month. For a given MOS, ACF can assume one of three values: low (pre-April 1993), high (post-April 1993), or (3) none, depending on the month of the observation. To investigate unemployment effects, I obtained employment information from Department of Labor reports. The particular employment statistic I will apply in the analysis is the monthly rate of unemployment for noninstitutional persons 16-years old and older. With respect to the changing recruiting environment, I also compiled information on the U.S. Army's involvement in armed conflict overseas.

My rationale for selection of these variables are as follows:

1. Enlistment Bonus: Persons preferring immediate economic gain over college opportunities are likely to be attracted by bonus dollars. In addition, levels of enlistment bonus are directly controlled by the incentive review board.

2. Application of Army College Fund: Persons seeking college opportunities are likely to be drawn towards occupational specialties offering the Army College Fund. Like enlistment bonuses, the particular MOS's which are eligible for the Army College Fund can be directly controlled by the incentive review board.

3. Unemployment Rate: Previous researchers have found direct correlation between a decrease in job opportunities in the civilian sector and increased enlistments.

Although not controllable by the incentive review board, the unemployment situation is directly observable by persons seeking employment.

4. State of U.S. Involvement Overseas: Like the unemployment rate, military operations overseas, as portrayed by the media, are directly observable by the population at large and may impact on a person's decision to seek enlistment.

I will attempt to develop models which relate levels of enlistment bonus, application of ACF, unemployment rate, and state of U.S. involvement overseas to the number of enlistment contracts signed within each of the critical military occupational specialties.

3.3 *Critical Specialties*

In order to scope this study, I will examine the specialties deemed critical by the incentive review board at the time of their November 1993 conference. Of the 235 military occupational specialties monitored by the incentive review board, 33 of these specialties were declared critical since they lagged behind the Army average fill of training seats available. Average fill for all Military Occupational Specialties during the month of November was 55%. The 33 critical military occupational specialties are shown in Table 3.1. There are no priorities associated with the specialties listed.

Table 3.1

MOS	Title
01H1	Biological Assistant
02D1	French Horn Player
02H1	Oboe Player
11M1	Fighting Vehicle Infantryman
11XG	Infantryman (COHORT)
11X1	Infantryman
12BE	Combat Engineer (COHORT)
12F1	Engineer Tracked Vehicle Crewman
13BE	Cannon Crewmember (COHORT)
14R1	Sight Forward Heavy Crewmember
19K1	M-1 Armor Crewman
24T1	Patriot Operator/System Mechanic
29V1	Microwave Systems Operator - Repairer
35H1	Test, Measurement, and Diagnostic Equip
39E1	Special Electronic Devices Repairer
91CC	Practical Nurse
91VC	Respiratory Specialist
93D1	Air Traffic Control Equipment Repairer

93F1	Field Artillery Meteorological Crew
94B1	Food Service Specialist
97B6	Counterintel Assistant (Korean)
97EC	Interrogator (Persian - Farsi)
97EN	Interrogator (Tagalog)
97E3	Interrogator (Spanish American)
98D1	Emitter Locator/Identifier
98GC	EW/SIGINT Voice Interceptor (Farsi)
98GU	EW/SIGINT Voice Interceptor (Thai)
98GV	EW/SIGINT Voice Interceptor (Viet)
98G2	EW/SIGINT Voice Interceptor (Polish)
98G5	EW/SIGINT Voice Interceptor (Arabic)
98H1	Morse Interceptor
98K1	Non-Morse Interceptor/Analyst

3.4 *Model Building*

To illustrate the empirical model building process, I will apply multiple regression techniques in an evaluation of the enlistment bonus contracts for the 11X1 (Infantryman) military occupational specialty. The variables I will use in the analysis of the Infantryman contracting process are defined as follows:

$$Y_i \equiv \text{number of Infantry bonus contracts in month i} \quad 3.1$$

$$X_{i,1} \equiv \text{level of enlistment bonus in month i} \quad 3.2$$

$$X_{i,2} \equiv \text{unemployment rate} \quad 3.3$$

$$X_{i,3} \equiv \begin{cases} 0 & \text{if U.S. not in conflict during month i} \\ 1 & \text{if U.S. in conflict during month i} \end{cases} \quad 3.4$$

$$X_{i,4} \equiv \begin{cases} 1 & \text{if ACF offered at high level} \\ 0 & \text{otherwise} \end{cases} \quad 3.5$$

In this analysis, I will treat Y_i as the dependent variable with $X_{i,1}$ through $X_{i,4}$ as the potential set of predictor variables. Although other researchers have incorporated other predictors, such as the number of recruiters in the field and disparities between military and civilian wages, I have omitted these factors from consideration since they are neither controllable by the members of the incentive review board nor directly observable by potential recruits.

3.4.1 *Investigation of Relationships*. With an initial look at a time-series plot of the number of contracts, we can see if there are any significant patterns or trends to the behavior of monthly bonus enlistments of Infantrymen:

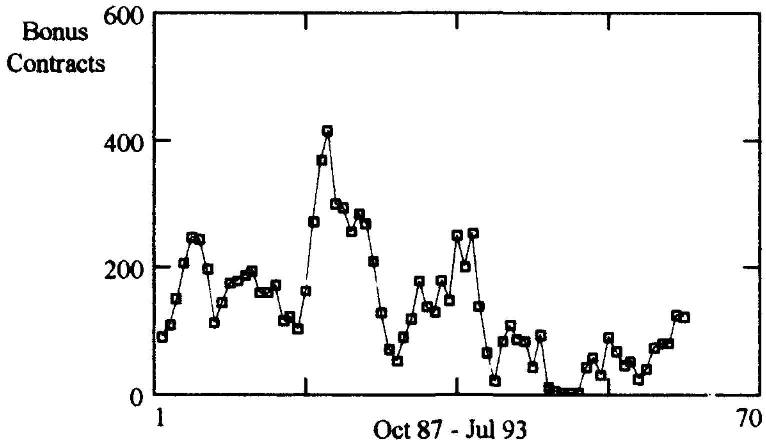

Figure 3.1

The time-series plot (Fig. 3.1) does not reveal any obvious patterns. Next, we can study the scatter plots of the dependent variable against each predictor to gain initial insights to the possible relationships that exist between dependent variable and predictors. Intuitively, one would believe that the number of bonus contracts is directly proportional to changes in enlistment bonus and unemployment. In other words, we expect increases in the number of enlistments as bonuses and unemployment increase. Because of changes in preferences, we expect bonus contracts to decline if increases in ACF draw recruits from accepting bonuses towards enlisting for the college fund option. Based on Thomas' remarks concerning decreased propensity to enlist with increased U.S. involvement overseas, we would expect enlistments to decline as U.S. participation in armed conflicts increase.

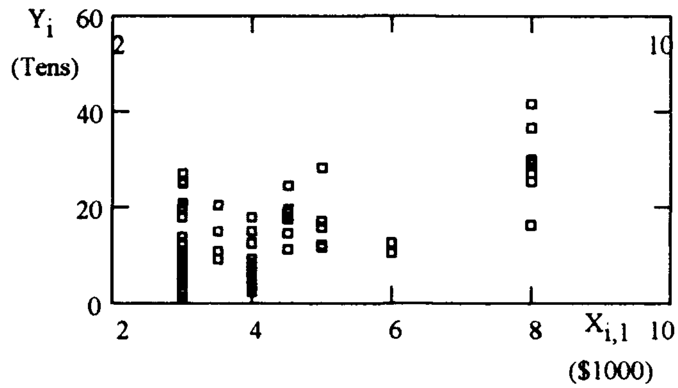

Figure 3.2

The scatter plot of the number of Infantry bonus contracts and level of enlistment bonus (Fig. 3.2) suggests that there may be a positive relationship between the amount of enlistment bonus and the number of enlistments.

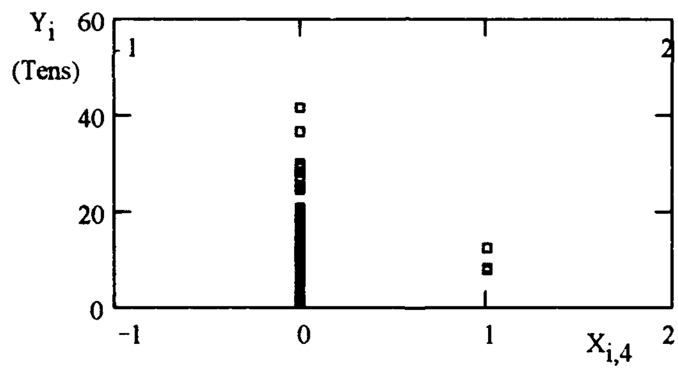

Figure 3.3

Keeping in mind that $X_{i,4}$ is an indicator variable which represents the Army College Fund at low and high levels, a visual comparison of the process mean as the level of ACF changes indicates that a negative relationship may exist between the number of bonus contracts and level of ACF. This is shown in the scatter plot above (Fig. 3.3).

As previously mentioned, one would expect a positive relationship to exist between enlistment contracts and unemployment rates. As career opportunities within the private sector decline, more and more people may turn to the military as another source of employment.

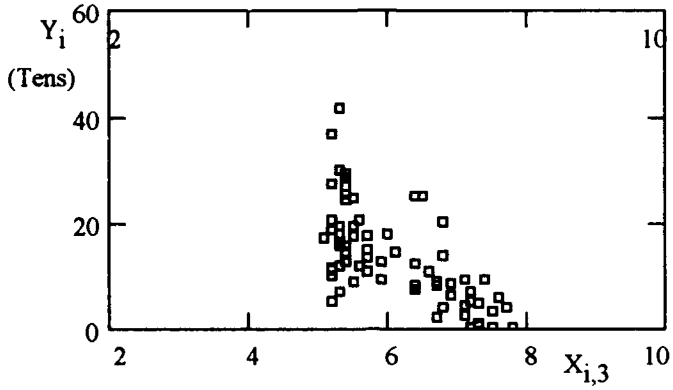

Figure 3.4

Examination of the scatter plot of the number of Infantry contracts and unemployment rate (Fig 3.4) fails to confirm our intuition. The positive relationship that we expected is not apparent, and the trend appears negative.

The scatter plot of the number of Infantry contracts and the state of U.S. involvement overseas (Fig 3.5) does not reveal any obvious patterns. Again, as an indicator variable, we can compare the process mean at each level of involvement and see that there may exist a slight decrease in the process mean when the country has troops committed in armed conflict. This agrees with our intuition.

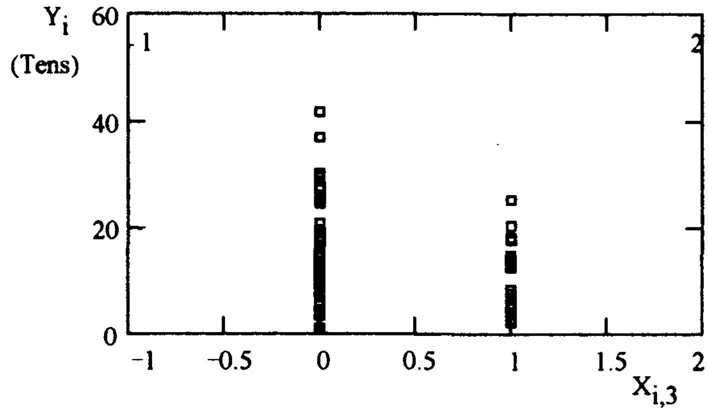

Figure 3.5

Examination of the scatter plots gives us an initial indication of the relationships between the predictor variables and the dependent variable. We may now proceed with fitting a model to the data.

3.4.2 *Multiple Regression Analysis.* Multiple regression is a common statistical tool used to investigate the relationships between a response (dependent) variable and more than one predictors (15:225). In order to increase the accuracy of the modeling process, I scaled the number of bonus contracts by 1/10 and bonus amounts by 1/1000 (9:616). The transformed variables then become:

$$Y_i' = \frac{Y_i}{10} \tag{3.6}$$

$$X_{i,1}' = \frac{X_{i,1}}{1000} \tag{3.7}$$

In this analysis, the first-order model involving all four predictors is as follows:

$$Y_i = \beta_0 + \beta_1 X_{i,1} + \beta_2 X_{i,2} + \beta_3 X_{i,3} + \beta_4 X_{i,4} + \epsilon_i \qquad 3.8$$

where β_0, β_1, β_3, and β_4 are model parameters and $X_{i,1}$ through $X_{i,4}$ are known constants. In order for us to apply the Method of Ordinary Least Squares to obtain parameter estimates of our model, we must also assume that the error terms (ε_i) are independent and normally distributed with constant variance. This is the assumption of homoskedasticity of error (15:229).

Application of Ordinary Least Squares results in the following parameter estimates for the full first-order model:

$$\beta = \begin{vmatrix} 35.21 \\ 2.49 \\ -5.32 \\ -4.58 \\ 2.91 \end{vmatrix} \qquad 3.9$$

and the subsequent response function.

$$Y_i' = 35.21 + 2.49X_{i,1}' - 5.32X_{i,2} - 4.58X_{i,3} + 2.91X_{i,4} \qquad 3.10$$

The parameters of the full-model agree with the potential relationships identified through examination of the scatter plots. We can now see if we can obtain a more parsimonious model (1:14) by eliminating predictors which do not significantly contribute to the explanation of variance in the enlistment contracting process. Application of the step-wise regression procedure (15:453) results in the following model:

$$Y_i^{'} = \beta_0 + \beta_1 X_{i,1}^{'} + \beta_2 X_{i,2} + \epsilon_i \qquad 3.11$$

which implies that changes in ACF and state of U.S. involvement overseas do not contribute to the explained variance of the number of Infantry bonus contracts signed in a given month. The fitted model is:

$$\hat{Y}_i^{'} = 35.39 + 2.32 X_{i,1}^{'} - 5.14 X_{i,2} \qquad 3.12$$

Prior to exploring the reasonableness of the model, we must first check model aptness. An aptness check is necessary to ensure that the features of the model are appropriate for the data under investigation (15:113). We must first ensure that the assumption of homoskedasticity is not violated. In this investigation, we make use of the residuals, which are the differences between observed and fitted values, as an estimate of error of the process.

One test for normality of error, is to produce a normal probability plot of the residuals

$$e_i = Y_i^{'} - \hat{Y}_i^{'} \qquad 3.13$$

against the expected value of the residuals when the distribution is normal. "A plot that is nearly linear suggests agreement with [the] normality [assumption]" (15:125). A plot which varies greatly from linearity suggests non-normality of error.

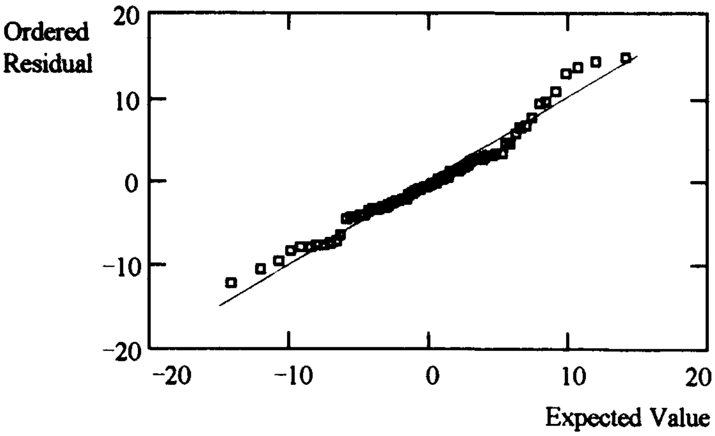

Figure 3.6

The normal probability plot (Fig 3.6) reveals a linear relation between the ordered residuals and the expected value of the ordered residuals under the assumption of normality. In my judgement, I claim the assumption of normality of error holds.

In order to examine the constancy of error variance, we construct a plot of the residuals against the fitted values. If our assumption holds, we expect the resulting points to be scattered in a horizontal band around zero with no apparent pattern.

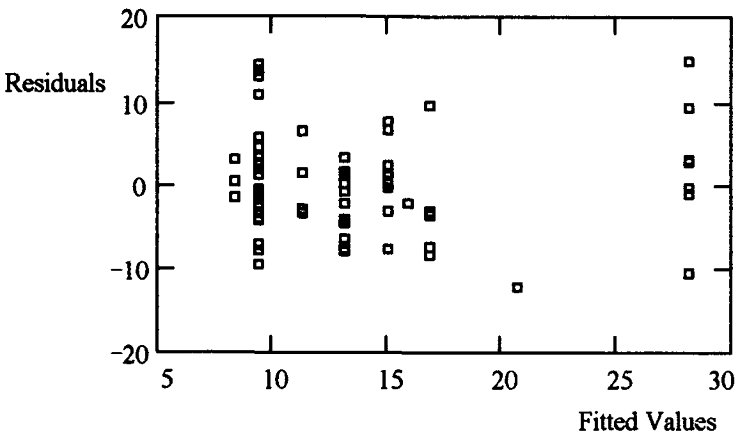

Figure 3.7

The points of the residual plot (Fig. 3.7) lie scattered in a horizontal band around zero. In my judgement, I claim that the assumption of constant error variance holds.

Another test of model aptness is to determine whether a regression relation exists. The ANOVA table associated with the fitted model is shown in Table 3.2.

Table 3.2

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square
Regression	3100.26	2	1550.13
Error	2490.92	67	37.18

We can now test the following hypotheses:

$$H_0: \quad \beta_1 = \beta_2 = 0$$

$$H_a: \text{ not all } \beta_k \ (k=1,2) = 0$$

The test statistic for this test is:

$$F* = \frac{MSR}{MSE}$$

and the decision rule is:

If $F^*<F(1-\alpha;p-1,n-p)$, conclude H_0

If $F^*>F(1-\alpha;p-1,n-p)$, conclude H_a

In this case, $F^*=41.694$ which exceeds $F(.95,2,60)=3.15$, and we see that we reject the null hypothesis and conclude that a relation relationship does indeed exist.

The coefficient of multiple correlation (R2) associated with this model is 0.554. This is a measure of how much variance of the process is accounted for by the model.

3.4.3 *Model Refinement*. In the interest of further refining model, we now investigate possible curvature and interaction effects. A step-wise analysis of a full second-order model, including all two-way interactions, finds that $X_{i,1}^2$ and $X_{i,2}^2$ are the significant predictors of the model. Due to statistical insignificance, none of the interaction effects are included in the model. In otherwords, inclusion of interaction terms does not help to explain away the variance of the process. The automated procedures applied in SPSS (a statistical software package) (17:359), did not reveal any multicolinearity effects or outliers. The second-order model increases the coefficient of multiple correlation to 0.578. This implies that a candidate model which can be applied to describe the relationships between bonus contracts and the predictors remaining in the model is:

$$\hat{Y}_i' = 24.87 + .228(X_{i,1}')^2 - .412(X_{i,2}')^2 \qquad 3.14$$

A plot of the fitted model and observed values is as follows:

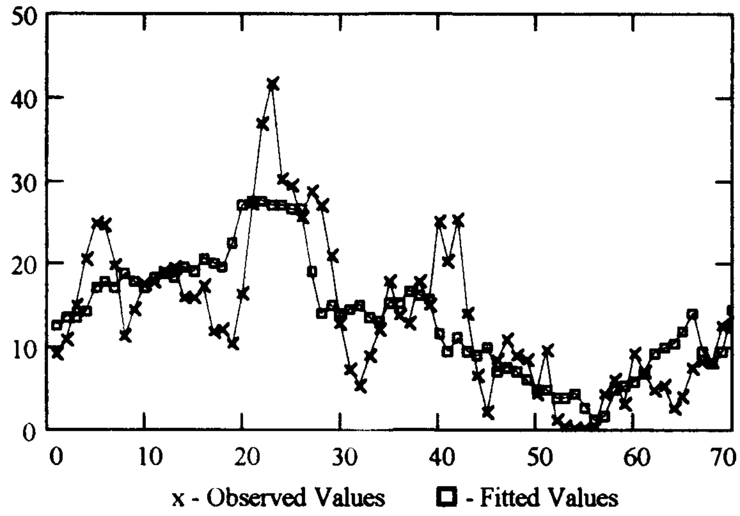

Figure 3.8

The plot in figure 3.8 shows that although the model is unable to capture all of the variation of the process, it does appear to represent the general behavior of monthly contracting performance.

3.4.4 *Model Validation.* The final determination for appropriateness of the model is validation. "Model validity refers to the stability and reasonableness of the regression coefficients, the plausibility and usability of the regression function, and the ability to generalize inferences drawn from the regression analysis" (15.438). For the validation effort, I will use data accumulated from August through December 1993. As a test of model validity, I will compare the mean squared prediction error (MSPR), which is calculated by:

$$\text{MSPR} = \frac{\sum_{i=1}^{n^*} (Y_i - \hat{Y}_i)^2}{n^*} \qquad 3.15$$

with the mean squared error (MSE) obtained from the model-building data set. Mean squared error is calculated by:

$$MSE = \frac{\sum (Y_i - \hat{Y}_i)^2}{n - 2} \qquad 3.16$$

In this case, MSPR = 39.729 and MSE = 36.55. Therefore, I conclude that the estimated response function (Eqn. 3.14) adequately represents the bonus contracting process. I will use this relationship in the estimation of the enlistment bonus elasticity.

3.5 *Estimation of Elasticities*

Now that we possess a model which represents the process of bonus contracts within the 11X1 market, we can proceed with calculation of the elasticity of interest. In this instance, we will estimate the elasticity of bonus contracts with respect to changes in the level of enlistment bonus. The elasticity, while maintaining transformed variables, is computed as follows:

$$e_{Y',X_1'} = \frac{\%\ \Delta\ \text{bonus contracts}}{\%\ \Delta\ \text{enlistment bonus}} = \frac{\delta\ Y_i'}{\delta\ X_1'}\ \frac{X_1'}{Y'} \qquad 3.17$$

Because of the nature of our response function (Eqn 3.14), we must evaluate the elasticity in the neighborhood of a point. By convention, the elasticity is usually evaluated by substituting the sample means for values of X' and Y'. For our sample, the respective sample means are:

$$\bar{Y}' = 13.6 \text{ and } \bar{X}_1' = 4.193$$

and referring back to our response function,

$$\hat{Y}_i' = 24.87 + .228(X_{i,1})^2 - .412(X_{i,2})^2 \qquad 3.14$$

we compute the partial derivative with respect to X_1' which results in the following:

$$\frac{\delta Y'}{\delta X_1'} = .456X_1' \qquad 3.18$$

Substitution into our elasticity formula (Eqn 3.16) yields:

$$e_{Y',X_1'} = .456\ (4.193)\ \frac{(4.193)}{(13.6)} = .589 \qquad 3.19$$

The elasticity tells us that a 1% increase in the level of enlistment bonus should yield a .589% increase in recruiting contracts. Keeping in mind that we transformed our original variables, our mean bonus level is $4193.00 and our mean number of contracts is 136. The elasticity estimated by equation 3.18 tells us that if we increase enlistment bonus by $42.00, we may get one more person to enlist. If we increase the level of bonus by 10%, or $420.00, we should see an increase of eight enlistments. Armed with estimates of elasticities, the incentive review board can more accurately adjust bonus levels to affect

increases in enlistment contracts.

3.6 *Investigation of Differences in Mean Response*

In examining the effects of the Army College Fund, we apply the same model building procedures described in Section 3.4. Performing the stepwise regression procedure with the number of ACF contracts as the dependent variable and the predictors described in equations 3.2 - 3.5 resulted in the following response function:

$$E[Y]_i = -242.43 + 76.36X_2 - 5.61X_2^2 \qquad 3.20$$

As we see, it appears that the number of ACF contracts is only responsive to changes in unemployment. The variable $X_{i,4}$ was a qualitative variable which represented the application of ACF. If $X_{i,4}$ remained in the model, it would have indicated a change in mean response resulting from application of ACF. Unfortunately, the ACF indicator variable did not remain in the estimated response function.

For the 11X1 market under investigation, there was not enough fluctuation in the offer of ACF. Of the 70 observations, ACF was offered at the low-level for 66 months and at the high-level for 4 months. The subtle change in ACF offers could not explain the relatively large month-to-month variance of ACF option enlistments. To illustrate the effectiveness of ACF as an enlistment incentive, we will investigate the 29V1 market.

The 29V1 MOS is associated with the job of Microwave Systems Operator Maintainer. Although I would expect this technically oriented MOS to be more

responsive to enlistment bonuses, the fact that bonuses were rarely offered for this MOS explains the absence of the $X_{i,1}$ variable from the response function. The response function for 29V1 ACF enlistees is:

$$E[Y] = .24 + 90.96X_4 - 11.79X_2X_4 \qquad 3.21$$

With X_4 a (0,1) indicator variable, the equation can be decomposed into the following two response functions:

$$E[Y] = .24 \qquad \text{(ACF not offered)}$$

$$E[Y] = (.24 + 90.96) - 11.79X_2 \qquad \text{(ACF offered)}$$

Although there exists the interaction effect of ACF offer and unemployment (eqn. 3.20), it is still readily apparent that there is a significant difference in mean response. The effect of ACF is portrayed in figure 3.9.

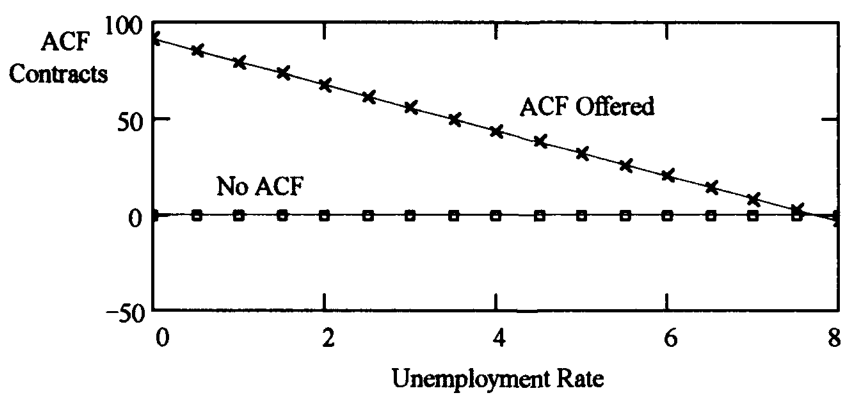

Figure 3.9

This implies that ACF is effective in increasing the number of persons enlisting for the 29V1 MOS. Again, the incentive review board can now use this information to improve the percent fill of Microwave System Operator Maintainer training slots.

We can apply the same analysis to all military occupational specialties and examine the response of contracts to changes of monetary incentives. Again, for purposes of this study, I will investigate those skills which were deemed critical during the November 1993 Incentive Review. These results will be presented in Chapter 4.

IV. *Findings and Insights*

4.1 *Introduction*

In the conduct of this study, I performed the stepwise regression procedure on each of the occupational specialties identified in table 3.1. For each MOS, I built three separate regression models: (1) Bonus Contracts as the dependent variable, (2) ACF Contracts as the dependent variable, and (3) Total Contracts as the dependent variable. For all regression models, I used the dependent variables as shown in equations 3.2 -3.6. In the 11X1 example discussed in section 3.4, ACF only assumed low and high values. For some Military Occupational Specialties, ACF assumed all three classes; no ACF, low-level (pre-April 1993), and high-level (post-April 1993). For these specialties, I added a second indicator variable. When used in regression models, a qualitative predictor with c classes is represented by c-1 indicator variables (15:351). These variables are defined as follows:

$$X_{i,4} = \begin{cases} 1 & \text{if ACF at Low-Level} \\ 0 & \text{otherwise} \end{cases} \qquad 4.1$$

$$X_{i,5} = \begin{cases} 1 & \text{if ACF at High-Level} \\ 0 & \text{otherwise} \end{cases} \qquad 4.2$$

When $X_{i,4}$ and $X_{i,5}$ both equal zero, ACF is not offered. In all models, the variable $X_{i,1}$, which represents level of bonus, is measured in thousands of dollars, and unlike the 11X1 example, the dependent variable is no longer scaled.

Upon completion of building the regression models, I noticed that not all specialties were responsive to changes in the amount of enlistment bonus. Likewise, enlistments for some specialties did not respond to changes of ACF, and other MOS's were completely non-responsive to any of the predictors. I present these findings in the remainder of this chapter.

I will first discuss responsiveness of bonus contracts to changes in enlistment bonuses. For each responsive MOS, I will present the regression function and show the elasticity evaluated at the sample mean. I will then present specialties whose regression functions show that changes of bonus contracts are related to factors other than changes in enlistment bonuses. I will then offer explanations for specialties which exhibited no fluctuation in the number of bonus contracts. In the same manner, I will then discuss responsiveness of ACF contracts to changing levels of ACF. I will conclude this chapter with an analysis of how the model results differ from the actions of the incentive review board and the consequence of not applying these techniques to the decision making process.

4.2 *Effectiveness of Enlistment Bonuses*

4.2.1 *Responsive Occupational Specialties.* Bonus contracts for MOS's presented in table 4.1 exhibited responsiveness to changes of offers of enlistment bonuses. The marks the variable headings indicate the factors which are present in the regression functions. Although not indicated in the table, sometimes appear in the regression function as part of an interaction term. The table is as follows:

Table 4.1

MOS	Title	X1	X2	X3	X4	X5
01H1	Biological Assistant	xx	xx	xx		
02H1	Oboe Player	xx	xx			xx
11X1	Infantryman	xx	xx			
24T1	Patriot Operator/System Mechanic	xx				
29V1	Microwave Systems Operator - Repairer	xx				
35H1	Test, Measurement, and Diagnostic Equipment	xx				
39E1	Special Electronic Devices Repairer	xx	xx			
91CC	Practical Nurse	xx	xx			
91VC	Respiratory Specialist	xx				
93F1	Field Artillery Meteorological Crewmember	xx	xx			
94B1	Food Service Specialist	xx		xx		
97E3	Interrogator (Spanish - American)	xx	xx			xx
97EC	Interrogator (Persian - Farsi)	xx				xx
98D1	Emitter Locator/Identifier	xx				
98H1	Morse Interceptor	xx				
98K1	Non-Morse Interceptor / Analyst	xx				

As an example of the calculations applied during this part of the analysis, I will show the computational steps performed on the 01H1 MOS. The bonus contract response function for the biological assistant specialty (01H1) is:

$$E[Y] = 6.26X_1 - .79X_1X_2 - .45X_1X_3 \qquad 4.3$$

and the sample means are $\bar{Y} = .60$ and $\bar{X}_1 = 1.164$. The elasticity of bonus contracts with respect to changes in bonus level, evaluated at the sample means, is:

$$e_{Y,X_1} = (6.26 - .79\bar{X}_2 - .45\bar{X}_3)\left(\frac{\bar{X}_1}{\bar{Y}}\right) = 1.89 \qquad 4.4$$

Imputing a change in bonus in the neighborhood of this point results in:

$$1\% \uparrow X_1 \rightarrow .0189\bar{Y} \rightarrow .01 \text{ additional contracts}$$

Therefore, in the neighborhood of the sample means, bonus contracts are slow to respond to changes in levels of enlistment bonus. In this case, a $35.00 increase in bonus results in a .01 increase in enlistment contracts. Because the arc elasticity only applies to measurements near the neighborhood of the point at which it was evaluated, we cannot directly interpret the relative changes which occur away from this point. We can, however, apply bold changes in one variable and use the estimated elasticity to gain insight into the direction and magnitude required to bring about a desired percentage change in one of the variables. This information is useful, however, because members of the review board can now apply the information given by the elasticities to estimate the percent change of bonus dollars necessary to bring about the desired percent change in the number of contracts. With this initial estimate, substitution back into the response function provides an estimate of the expected change in bonus contracts resulting from their imposed change in bonus dollars. Suppose the board wants one more person to enlist in this MOS. This implies:

$$\% \, \Delta \, Y = \frac{Y_{new} - Y_{old}}{Y_{old}} = \frac{1.6 - 0.6}{0.6} = 166\% \qquad 4.5$$

Substitution into the elasticity relationship results in:

$$\frac{\% \, \Delta \, Y}{\% \, \Delta \, X} = \frac{166\%}{\% \, \Delta \, X} = 1.89 \qquad 4.6$$

and rearrangement of equation 4.6 yields:

$$\% \, \Delta \, X = \frac{166\%}{1.89} = 84.65\% \qquad 4.7$$

This tells board members that in order to get one more enlistee into the biological assistant field, they should increase the current level of enlistment bonus by about 85%. In this example,

$$\bar{X}_1 = 1.164$$

and an 85% increase implies the board members should offer a 1.164 + (0.85) 1.164 = 2.153, or roughly, a $2150 bonus, in order to enlist one more person. Substituting this estimate into the response function (Eqn. 4.3) yields:

$$E[Y] = 6.26(2.15) - .79(2.15)(6.4) - .45(2.15)(1) = 1.6$$

which indicates that we can expect at least one person to enlist given the increase in enlistment bonus.

Results for the remaining MOS's which are responsive to changes in enlistment bonuses are shown in table 4.2. The elasticity listed in column 3 of table 4.2 is the elasticity of bonus contracts with respect to level of enlistment bonus when evaluated at the sample means. The change in Y column indicates the increase of bonus contracts resulting from a 1% increase in enlistment bonus when evaluated at the sample means.

Table 4.2

MOS	E[Y] = E[Number of Bonus Contracts] =	Elasticity	Δ Y
02H1	$6.26X_1 - 0.79X_1X_2 - 0.45X_1X_3$	1.48	0.0002
11X1	$28.47 + 2.32X_1^2 - 4.12X_2^2$	0.589	0.08
24T1	$3.33X_1$	0.998	0.009
29V1	$1.46X_1^2$	0.199	0.001
35H1	$0.131 + 1.52X_1^2$	0.256	0.0053
39E1	0.0[illegible] $+ 40.61X_1 - 7.18X_1X_2$	-1.11	-0.002[illegible]
91CC	$0.29 + 0.38X_1^2 - 0.19X_1X_2$	1.86	.05
91VC	$0.009X_1^2$	1.25	0.0018
93F1	$-22.06X_1 + 4.74X_1X_2$	2.20	0.03
94B1	$6.88 - 4.03X_3$	.916	0.16
97E3	$4.25X_1X_5$	10.65	0.005
97EC	$2.12X_1X_5$	16.3	0.002
98D1	$0.076X_1$	0.338	0.002
98H1	$0.127X_1^2$	1.04	0.025
98K1	$0.083X_1^2$	1.03	0.015

Table 4.2 contains critical MOS's which were responsive to changes in enlistment bonus. This is to say that a relationship existed in which the number of enlistment bonus contracts are a function of the level of enlistment bonus and possibly other factors. With the exception of MOS 39E1, an increase of enlistment bonus should result in an increase in the number of contracts. The elasticities also give them the magnitudes of the resulting increase. The information presented in table 4.2 tells the incentive review board an indication of the extent to which can modify existing enlistment bonuses in order to influence changes in the number of bonus contracts, and subsequently, meet recruitment objectives.

The information in table 4.2 also tells the incentive review board that they should not apply enlistment bonuses to MOS 39E1 since, for some reason, it will tend to decrease the number of bonus contracts. Although other competitive effects, such as changes to ACF or incentives in other MOS's may be the cause of the inverse relationship, examination of competitive effects is beyond the scope of this thesis.

4.2.2 *Non-Responsive Occupational Specialties.* The stepwise procedure also revealed two military occupational specialties which were not responsive to changes in enlistment bonus. The number of enlistment contracts for these MOS's were not a function of enlistment bonus. This is not to say that the number of bonus contracts did not fluctuate over the 70-month period. On the contrary, the relationships revealed that changes in the number of bonus contracts resulted from changes in other factors, such as unemployment or level of conflict. These "non-responsive" MOS's are as follows:

Table 4.3

MOS	Title	E = [Y] = E[Number of Bonus Contracts] =
12F1	Engineer Tracked Vehicle Crewman	$5.54 - 0.97X_2 - 1.79X_4$
19K1	M-1 Armor Crewman	$6.32 + 31.02X_3$

For MOS 12F1, it is interesting to note that bonus contracts actually decrease when unemployment increases. This is a counter-intuitive finding. This response function also shows decreases in bonus contracts as ACF offers for 12F1 increase. This could be a competitive effect. Of greater interest, however, is that if we hold unemployment and ACF constant, the number of bonus contracts seems to be constant, regardless of bonus level. This may imply that we are over-spending for 12F1 bonuses. This same implication holds for MOS 19K1, and warrants further investigation.

4.3.3 *Absence of Relationship*. MOS's not discussed in sections 4.3.1 and 4.3.2 were omitted from the analysis. For these occupational specialties, there was no relationship between bonus contracts and any of the indicator variables. These specialties, and the possible reasons for lack of a significant regression relationship, are listed in table 4.4:

Table 4.4

MOS	Title	Reason for Lack of Relationship
02D1	French Horn Player	No Bonus Takers
11M1	Fighting Vehicle Infantryman	Not Eligible for Monetary Incentives
11XG	Infantryman (COHORT)	COHORT Behavior
12BE	Combat Engineer (COHORT)	No Bonus Takers
13BE	Cannon Crewmember (COHORT)	COHORT Behavior
93D1	Air Traffic Control Equipment Tech	Incentives Never Offered
97B6	Counterintel Assistant (Korean)	No Fluctuation in Bonus Offer
97EN	Interrogator (Tagalog)	Sparse Observations
98G2	Voice Interceptor (Polish)	No Bonus Takers
98G5	Voice Interceptor (Arabic)	Sparse Observations
98GC	Voice Interceptor (Farsi)	No Bonus Takers
98GU	Voice Interceptor (Thai)	Sparse Observations
98GV	Voice Interceptor (Viet)	No Bonus Takers

For all MOS's in which a bonus was offered but not accepted, we can rationalize that bonus levels were not sufficient to draw persons towards those MOS's. One reason for people shying away from accepting the enlistment bonus option when enlisting for a Cohesion Readiness Training (COHORT) MOS is that acceptance of the enlistment bonus implies a 4-year initial term of service. Some COHORT MOS's offer a monetary COHORT bonus for the standard 3-year enlistment with a COHORT unit. For example, MOS 11XG, COHORT Infantry, offered a $1000 bonus for enlisting to serve three years in a COHORT unit. A person also had the option to receive an enlistment bonus of

$4000 instead of the $1000 COHORT bonus. The trade-off was an additional year of service. More than 90% of the recruits who volunteered for COHORT units accepted the lower COHORT bonus with a shorter term-of-service.

Time-of-service requirements, although not investigated as part of this study, tend to impact enlistment decisions and acceptance/rejection of enlistment bonuses. Time-of-service requirements seem to impact upon recruitment efforts in linguistic-related fields, such as interrogators and voice interceptors. Because of language training requirements, persons enlisting in these MOS's must serve a minimum of five years during their first term-of-service. Most MOS's require only a three-year service commitment for initial enlistment. Although I did not investigate this possible relationship, I believe that potential recruits are not willing to commit five years of their life to military service in exchange for the $8000 bonus.

In most cases, fluctuations of bonus contracts and enlistment bonuses were positively related as we anticipated. Military occupational specialties which did not exhibit a positive elasticity of bonus contracts with respect to changes in bonus levels may be worthy of further investigation. Understanding the elasticities of enlistment bonuses should result in increased efficiency and effectiveness of the Army Monetary Incentive Review and Allocation process.

4.3 *Effectiveness of the Army College Fund*

4.3.1 *Responsive Occupational Specialties.* As discussed in Chapter 3, the measure of effectiveness of the Army College Fund is the difference in mean response of the

regression relationship as the ACF option is applied. The dependent variable in this case is the number of Army College Fund contracts. An increase in mean response when ACF is applied to a specific MOS indicates effectiveness of the Army College Fund in drawing recruits to that MOS. No change in mean response indicates ineffectiveness of the Army College Fund. This analysis is simplified by the fact that the expected value of ACF contracts when ACF is not offered is zero. More importantly, the magnitude of increase in mean response directly translates to the number of ACF contracts the incentive review board can expect to gain by offering ACF to a specific MOS when holding other factors of the regression function constant. Table 4.5 lists responsive specialties and their associated response functions. Military occupational specialties which responsive to changes in ACF are:

Table 4.5

MOS	E[Y] = E[ACF Contracts] =
02D1	$0.60X_1X_5 + 0.80X_4$
12F1	$0.94 + 11.711X_4$
14R1	$-31.66X_2X_5 - 212X_3X_5$
24T1	$0.56 + 11.48X_4 - 6.188X_3X_4$
29V1	$90X_4 - 11.778X_2X_4$
39E1	$12.73X_4 - 1.64X_2X_4$
93F1	$-31.86X_4 + 5.67X_3X_4 + 4.60X_2X_4$
97B6	$0.20X_3X_4$
97E3	$8.72X_1X_5 - 4.44X_2X_5 + 0.029X_1^2$

Direct substitution of predictor values into the equations listed in Table 4.5 gives members of the incentive review board an inclination of the increases in ACF contracts they can expect by application of ACF to a specific MOS. For example, when we offer ACF to potential enlistees of MOS 97B6 and the current unemployment rate is 5%, we can expect to contract about one more person than we would when ACF is not offered. We now look at occupational specialties which do not appear to be affected by changes in the Army College Fund.

4.3.2 *Non-Responsive Occupational Specialties.* As with enlistment bonuses, not all specialties are responsive to offers of the Army College Fund. Table 4.6 lists the MOS's which do not exhibit relationships between the number of ACF contracts and changes in offers of the Army College Fund. Variance in the number of ACF contracts were dependent on other factors. Of the four specialties, it appears that ACF varies with changes in unemployment. This implies that people are being attracted to the Army because of lack of civilian work opportunities. These recruits then elect the ACF option because it is being offered. Again, this may imply that the Army is over-spending in the sense that we award ACF to recruits who may have contracted without the ACF offer.

Table 4.6

MOS	E[Y] = E[Number of ACF Contracts]
19K1	$-2617 + 834X_2 - 64X_2^2$
91CC	$0.027X_1X_2$
94B1	$-21.44X_1 + 14.4X_2 + 3.42X_1^2$
98K1	$0.06X_1^2$

4.3.3 *Absence of Relationship*. The occupational specialties listed in Table 4.7 did not exhibit variance in ACF contracts which could be explained by any of the model predictors.

Table 4.7

MOS	Reason for Lack of Relationship
01H1	No ACF Takers
02H1	Sparse Observations
11M1	Not Eligible for Incentives
11XG	COHORT -- Not Eligible
12BE	COHORT -- Not Eligible
13BE	COHORT -- Not Eligible
35H1	ACF Never Offered
93D1	ACF Never Offered
97EC	Sparse Observations
97EN	No ACF Takers
98D1	Large Variance
98G2	No ACF Takers

Table 4.7 (Continued)

MOS	Reason for Lack of Relationship
98G5	No ACF Takers
98GC	No ACF Takers
98GU	No ACF Takers
98GV	No ACF Takers
98H1	Large Variance

"Sparse observations" refer to cases in which only one or two ACF takers enlisted for the ACF option although the Army College Fund option was available for most of the periods under observation. This results in a mean ACF level very close to zero. "Large variance" refers to fluctuations of the number of ACF contracts which cannot be explained by small variance of ACF offers. It is readily apparent that multiple regression cannot identify relationships for predictors which do not change. Therefore, MOS's which have never been offered ACF are dropped from the analysis. In the cases where ACF has never been accepted as an enlistment option, it may be likely that this phenomena is linked to the time-in-service requirements discussed in section 4.2.3. Again, the MOS's which do not seem to attract enlistees are linguistic-training related. It is likely that potential recruits are not willing to serve an initial enlistment period of five years when they can obtain the same amount of college money by serving in an specialty with a shorter service requirement.

As in the understanding of enlistment bonus elasticities, the incentive review board can use the information obtained through an analysis of ACF responsiveness to influence

the numbers of ACF contracts within specific specialties. The board can directly apply ACF to specialties which display differences in mean levels of ACF contracts with respect to levels of ACF. For MOS's which are non-responsive to changes in ACF, they should consider other forms of enlistment incentives and further investigation is needed to determine relationships of occupational specialties which have never been offered the Army College Fund. Understanding the effects of changes in application of the Army College Fund should increase the efficiency and effectiveness of the Army Monetary Incentive Review and Allocation Process.

4.4 *Enlistment Bonus Case Study.*

In an effort to quantify the benefits which can be gained by understanding and applying the relationships discussed in Sections 4.2 and 4.3, I will perform a case study to compare my empirical models to real-world behavior. The case study will be applied to observations of August 1993. Using the critical occupational specialties already evaluated, I will state the bonus changes applied by the incentive review board, compare these to the changes implied by the models, and report the true enlistment results.

The incentive review board met in July 1993 to propose incentive changes for the last quarter of fiscal year 1993. At that time, the average fill rate for the occupational specialties was 19.56%. Table 4.8 shows critical specialties, percentage by which each MOS lagged the Army average fill rate, incentives in effect at the time the board convened, and incentives approved upon completion of the review and allocation process. Although I have researched all MOS's discussed thus far in this report, for

purposes of this case study, I have omitted MOS's that exceeded the Army fill average when the board convened in July. I have also omitted the occupational specialties which did not display a relationship between bonus contracts and changes in enlistment bonus. My justification for these omissions is that lack of relationships provide no additional information. Thus, they have the same effect as board members' reliance on intuition and experience.

Table 4.8

MOS	% Below AVE Fill	July Bonus	July ACF-Level	August Bonus	August ACF-Level
01H1	17.74	3.5	Yes	3.5	Yes
02H1	12.42	3.5	Yes	5.0	Yes
11X1	13.52	4.0	Yes	6.0	Yes
19K1	15.22	3.5	Yes	3.5	Yes
35H1	19.56	0.0	No	0.0	No
91CC	18.23	6.0	Yes	8.0	Yes
91VC	18.65	8.0	Yes	8.0	Yes
98D1	18.21	0.0	Yes	5.0	Yes
98K1	19.04	4.0	Yes	4.0	Yes

Table 4.9 displays the number of persons already contracted in each of the critical specialties (column 2), the number of new contracts required to reach average fill rate (column 3), and the percent change in contracts required to reach that level (column 4). For example, as of July of 1993, MOS 01H1 had only one person contracted. This MOS

had a requirement of 55 total contracts. To reach the Army average fill, this MOS needed to get to the 20% level, (0.20)55 = 11, an increase of 10 additional contracts. In order to increase from 1 contract to 11 contracts, MOS 11H1 required the following percent increase in contracts:

$$\% \Delta Y = \frac{Y_{new} - Y_{old}}{Y_{old}} = \frac{11 - 1}{1} = 10 \rightarrow 1000\%$$

This table also shows the enlistment bonus elasticities evaluated, not at the sample mean, but at the current level of the process (column 5), and the estimated percent change in bonus level to bring about the desired percent change in contracts. Again, percent change in X is an extrapolation derived by application of the elasticity relationship evaluated at the current level of the process. Substitution into the respective response functions should give an indication as to whether or not the resulting increase in bonus dollars is appropriate for the desired increase in bonus contracts.

Table 4.9

MOS	Current Y	Required Y	% Δ Y	Elasticity	% Δ X
01H1	1	11	1000	1.68	595
02H1	1	3	200	2.14	93
11X1	676	2238	231	0.52	444

Table 4.9 (Continued)

MOS	Current Y	Required Y	% Δ Y	Elasticity	% Δ X
19K1	133	613	360	N/A	N/A
35H1	0	6	600	3.07	195
91CC	9	135	1400	3.22	435
91VC	1	22	2100	2	1050
98D1	1	15	1400	2	700
98K1	1	38	3700	2.01	1840

Table 4.10 compares the changes in enlistment bonuses imposed by the incentive review board against the increases resulting from application of the elasticities. Column 2 shows the bonus levels set by the board, column 3 represents the percent change in bonus resulting from the board's decision, and column 4 shows the number of bonus contracts for the month of August. Column 5 shows the bonus level recommended by the empirical models. A "MAX" entry indicates a recommended change in excess of $8,000 enlistment bonus cap for which I set the level of bonus to the $8,000 maximum. Column 6 shows the expected value of bonus contracts for the month of August given the application of bonus levels determined by the elasticities.

Table 4.10

MOS	Bonus Imposed	% Δ X	Bonus Contracts	Recommended Bonus Level	Expected Contracts
01H1	3.5	None	1	MAX	6
02H1	5.0	43	0	6.75	2
11X1	6.0	50	132	MAX	405
19K1	3.5	None	35	"Minimum"	37
35H1	0.0	None	0	1.95	6
91CC	8.0	33	9	MAX	14
91VC	8.0	None	0	MAX	0
98D1	5.0	5000	6	MAX	3
98K1	4.0	None	8	MAX	5.3

For the first the occupational specialties of 01H1, 02H1, 11X1, 35H1, and 91CC, it appears that application of the elasticities found through empirical modeling could have potentially increased the number of bonus contracts compared to what actually occurred in August of 1993. In the case of 91VC, it is apparent that the maximum bonus is not sufficient to entice enlistments.

For the specialties of 98D1 and 98K1, it is interesting to note that bonus levels applied by the incentive review board were below levels suggested by the elasticities found through empirical modeling. Even at these amounts, the bonuses resulted in bonus contracts in excess of the number of bonus contracts predicted by the models. It is possible that other incentives, such as a quick ship bonus, were applied to these MOS's

during this time frame. A quick ship bonus is an additional monetary payment for enlistees who agree to attend training within 30 days of enlistment. The causes of this unexpected level of bonus contracts warrant further investigation.

The most interesting finding is the number of 19K1 bonus contracts signed. Our response function for 19K1 bonus contracts does not include bonus amount as an independent variable. Recall that the expected number of bonus contracts for 19K1 was only a function of level of conflict. This may be an indication of persons who fully intended to join the military as an M-1 Armor Crewman and simply accepted the bonus because it was offered. In this case, the response function predicted 37 bonus contracts for the month of August. A $3500 enlistment bonus was offered, and the actual number of bonus contracts signed in August was 35. This implies that the Army may have paid $122,500 in enlistment incentives to soldiers who fully intended to enlist, regardless of incentive. This is a case where application of the relationships developed through empirical modeling may lead to actual dollar savings. It is apparent that understanding the relationships between the number of bonus contracts and levels of enlistment bonus can lead to improved effectiveness and efficiency of the monetary incentive review and allocation process.

The results presented in this chapter illustrate the utility of examining the relationships between contracts and enlistment incentives. Armed with this information, the members of the incentive review board can allocate monetary enlistment incentives without complete reliance on intuition and experience, and in the process, realize increased enlistments and potential dollar savings.

V. Conclusions and Recommendations

5.1 *Improving the Incentive Review Process*

In it's current state, the U.S. Army Monetary Enlistment Incentive Review and Allocation process is based purely on experience and intuition. As such, there exists no checks or balances to measure the effectiveness or efficiency of the process. In this research effort, I have shown simple application of multiple regression techniques which allow for the estimation of relationships between enlistment contracts and factors which influence their behavior. Applying the knowledge gained through the investigation of these relationships may result in higher contract rates as well as dollar savings. Specific recommendations for improving the incentive review and allocation process are discussed in the following paragraphs.

5.1.1 *Investigation of Enlistment Bonus Relationships.* Once estimated, the relationships between bonus contracts and level of enlistment bonus indicate military occupational specialties which are responsive to changes in enlistment bonus. Offers of enlistment bonuses will be most effective for these specialties. More importantly, estimates of the elasticities will provide the board members with estimates of the changes of bonus levels required to bring about desired changes in the number of bonus contracts. This process will allow the incentive review board to more accurately adjust bonus levels amongst critical military occupational specialties, stimulate enlistment, and fill manpower shortages. Study of the relationships will also lead to identification of "over-payment" of enlistment bonuses and allow the Army to enli[illegible]red numbers of

personnel without unknowingly subjecting the organization to monetary waste.

Identification of military occupational specialties which are not responsive to changes in enlistment bonuses also contributes to improvement of the incentive review and allocation process. Monies earmarked for bonus payments in a non-responsive MOS can be allocated elsewhere. Non-responsiveness to the bonus incentive also alerts recruiting personnel of requirements for other strategies to attract potential recruits to these specialties.

I recommend a full investigation of the relationships between bonus contracts and bonus level for all military occupational specialties. For MOS's which appear to be non-responsive, I recommend decrease or deletion of existing bonus offers in an effort to assess the subsequent impact of the decrease or deletion. If there is no significant decline in the level of enlistments for these specialties, we may conclude that we have been spending excessively in order to enlist soldiers in these specific MOS's. Analysis of military occupational specialties ing in no relationship should be a clear indication that incentive measures, other than extreme increases of enlistment bonuses, may be required to entice potential recruits towards these specialties.

These relationships will need periodic updating, using current data, in order to account for potential changes in enlistment patterns or behaviors. A thorough analysis of all military occupational specialties and subsequent application of the findings should result in significant increases to enlistment levels and have the added benefit of saving bonus dollars.

5.1.2 *Investigation of ACF Relationships*. As with enlistment bonuses, relationships of ACF must also be investigated. Although about 45% of all test score category I-IIIA personnel enlist for the Army College Fund, this is in no way an indication that we are not over-spending here also.

For MOS's which seem to exhibit non-responsiveness to changes in the application of ACF, a simple test could be employed where ACF is not offered for a two-week period. Person's not interested in ACF would enlist regardless. Person's with an interest in a particular MOS but only if it associated with the Army College Fund option could be directed to return after the two-week test period. A more radical approach would be to allow these potential recruits to sign an enlistment contract "post-dated" for the effective period of the ACF option. This test could result in a determination of the sensitivity of specific MOS's to changes in the Army College Fund. Discovery of non-responsiveness could result in the saving of ACF dollars.

As in lack of relationships between bonus contracts and bonus dollars, lack of relationships discovered in the analysis of the Army College Fund is an indication that other strategies involving other incentives must be applied to the occupational specialties in question. An in-depth analysis of the relationships between enlistment contracts and the application of the Army College Fund could lead to increased effectiveness and efficiency of the incentive review process.

5.2 *Extensions of Current Research*

Other than the full analysis of all 235 military occupational specialties discussed in

sections 5.1.1 and 5.1.2, possible extensions of the research effort are: (1) Analysis of the Impact of Time-in-Service requirements (2) Investigation of Competitive Effects, (3) Present Value Analysis of the Army College Fund, and (4) Comparison of Empirical Models with Soldier Survey Results.

In my analysis, it appeared that all military occupational specialties involving language training were difficult to fill. These skills are unique in that enlistees spend up to 18 months in language school in addition to their normal entry-level military training. In order to take advantage of their investment, the Army requires that these soldiers serve a minimum of five years during their first term of service. It is apparent that monetary incentives alone are inadequate in drawing recruits towards these specialties. Although the organizational structure of the units in which these soldiers serve require junior enlisted personnel, investigating the potential of recruiting from within the ranks of active duty personnel may prove fruitful. New soldiers may be hesitant in committing five-years to the Army whereas soldiers already serving may have decided on a career of military service. Based on my experience as a company commander, it is likely that soldiers already committed to the Army are more willing to accept second enlistments of considerable length. These personnel would already be trained in basic soldier skills and serve in their new MOS immediately upon completion of language training.

Another alternative would be to decrease the time-in-service requirement for first-term soldiers serving in these specialties. This would be possible with the implementation of deletion of initial language training in exchange for language training programs within the unit. Once the soldier is adjusted to life in the Army, he may be

offered the opportunity to reenlist with subsequent attendance at the Defense Language Institute. Naturally, the trade off is that the unit receives a soldier who is initially not proficient in the language required of that MOS. Again, based on my command experience, it is better to possess a soldier who can be trained by competent non-commissioned officers than possessing no soldier at all. I believe exploring different alternatives for filling the ranks of language specialists is worthy of further investigation. Similar studies for all occupational specialties with lengthy time-of-service requirements should be studied.

In this research effort, I have ignored the effects of military occupational specialties competing for recruits from the same pool of potential soldiers. Previous research has discussed the market distribution effects of monetary enlistment incentives. Intuitively, a potential recruit interested in the Army College Fund is going to be drawn towards military occupational specialties offering the ACF option and steer clear of MOS's not offering college money. Without an understanding the competitive effects between specialties, it is possible to apply monetary incentives across the board which result in little net gain in recruiting contracts. Determination and understanding of effects between military occupational specialties can only lead to improvements within the incentive allocation process.

In this analysis, I treat the Army College Fund as a qualitative variable; either it is offered to an MOS or not. In this view, I ignore differences between the two-year, three-year, or four-year dollar amounts associated with acceptance of the Army College Fund. It may be interesting to investigate the effects the associated dollar amounts have on

time-of-service selection of a person enlisting for the Army College Fund. Assuming that a person enlists for the ACF option and attends college after completion of his initial enlistment, we could calculate the present value of the 2-year, 3-year and 4-year ACF options under an assumed inflation rate. We could also estimate the expected life-time income stream of an individual enlisting in a particular MOS. Assuming a wage differential between college graduates and non-graduates, the expected life-time income streams will differ between each of the period-of-enlistment options since a person accepting the 2-year ACF option has the potential of an additional year or two of earning income at a high wage rate in comparison to persons enlisting for the 3-year or 4-year ACF option. Such a study may provide insights to the effectiveness of the dollar amounts associated with each level of ACF and enhance effectiveness of the incentive allocation process.

To further provide insights into the existing enlistment relationships discussed in this report, enlistment surveys should be performed on all new recruits. These surveys should be designed to investigate reasons for enlisting in specific military occupational specialties. Comparison of reasons for enlisting could then be made against the empirical models developed from the data. These comparisons could either validate or refute enlistment relationships claimed by the models. Soldier surveys could lead to further improvement of the incentive review and allocation process.

5.3 *Conclusion.*

The Army College Fund and enlistment bonuses remain as the primary tools

recruiters possess to entice potential recruits into military service. A thorough understanding of the underlying nature of these monetary incentives are essential to effective and efficient allocation of recruiting dollars. In light of declining military budgets, there has been no time in which the success of the United States Army relied so heavily on effective and efficient operation of the Incentive Review and Allocation process.

Appendix A: SPSS Syntax for Data Sorting

In this appendix, I provide sample SPSS syntax used to sort data provided by USAREC. This syntax can be used if file names and directories are modified to meet user needs. The syntax shown represents one year's worth of enlistment data.

```
* This syntax splits the entire data file into files which contain annual data.

****************************************************************************

* The following command gets the file that I want to access.

get file = 'd:\thesis\data\bigsort.sav' /keep marital sex race1 dobdate
  edyrs educ record afqt paddate contdate accdate term aopt gtx gm el cl
  mm sc co fa of st bopt depend box nrsid ssnfull fullmos zip fip.

* The following command ensures that any system filters, which may cause
  me to exclude cases inadvertently, are turned off.

FILTER OFF.

* The following command is a double check to ensure that I am including
  all cases in the specified file.

USE ALL.

* The following command selects the cases I want selected.  In this case
  I will select cases from the year of 1992.

SELECT IF(contdate >= 920101  & contdate <= 921231).

* The following command tells the system to save the selected cases in
  a file named year92.sav and also to save it in compressed format.

save outfile = 'd:\thesis\data\year92.sav' /compressed.

****************************************************************************

* This splits the annual data files into files which contain monthly data.  Breaking the
  data into monthly "chunks" will allow for merging with unemployment files.
```

```
*****************************************************************************
*                        1992                        *
*****************************************************************************
```

* The following command gets the file that I want to access.

get file = 'd:\thesis\data\year92.sav' /keep marital sex race1 dobdate
edyrs educ record afqt paddate contdate accdate term aopt gtx gm el cl
mm sc co fa of st bopt depend box nrsid ssnfull fullmos zip fip.

* The following command ensures that any system filters, which may cause
me to exclude cases inadvertently, are turned off.

FILTER OFF.

* The following command is a double check to ensure that I am including
all cases in the specified file.

USE ALL.

* The following command selects the cases I want selected. In this case
I will select cases from the month of jan.

SELECT IF(contdate >= 920101 & contdate <= 920131). /*Jan92*/

* The following command tells the system to save the selected cases in
a file named jan92.sav and also to save it in compressed format.

save outfile = 'd:\thesis\data\jan92.sav' /compressed.

```
*****************************************************************************
```
*The following command gets the file that I want to access.

get file = 'd:\thesis\data\year92.sav' /keep marital sex race1 dobdate
edyrs educ record afqt paddate contdate accdate term aopt gtx gm el cl
mm sc co fa of st bopt depend box nrsid ssnfull fullmos zip fip.

* The following command ensures that any system filters, which may cause
me to exclude cases inadvertently, are turned off.

FILTER OFF.

* The following command is a double check to ensure that I am including
  all cases in the specified file.

USE ALL.

* The following command selects the cases I want selected. In this case
  I will select cases from the month of feb 92.

SELECT IF(contdate >= 920201 & contdate <= 920239). /*feb92*/

* The following command tells the system to save the selected cases in
  a file named feb92.sav and also to save it in compressed format.

save outfile = 'd:\thesis\data\feb92.sav' /compressed.

****
* The following command gets the file that I want to access.

get file = 'd:\thesis\data\year92.sav' /keep marital sex race1 dobdate
  edyrs educ record afqt paddate contdate accdate term aopt gtx gm el cl
  mm sc co fa of st bopt depend box nrsid ssnfull fullmos zip fip.

* The following command ensures that any system filters, which may cause
  me to exclude cases inadvertently, are turned off.

FILTER OFF.

* The following command is a double check to ensure that I am including
  all cases in the specified file.

USE ALL.

* The following command selects the cases I want selected. In this case
  I will select cases from the month of mar.

SELECT IF(contdate >= 920301 & contdate <= 920331). /*mar92*/

* The following command tells the system to save the selected cases in
  a file named mar92.sav and also to save it in compressed format.

save outfile = 'd:\thesis\data\mar92.sav' /compressed.

```
******************************************************************************

* The following command gets the file that I want to access.

get file = 'd:\thesis\data\year92.sav' /keep marital sex race1 dobdate
  edyrs educ record afqt paddate contdate accdate term aopt gtx gm el cl
  mm sc co fa of st bopt depend box nrsid ssnfull fullmos zip fip.

* The following command ensures that any system filters, which may cause
  me to exclude cases inadvertently, are turned off.

FILTER OFF.

* The following command is a double check to ensure that I am including
  all cases in the specified file.

USE ALL.

* The following command selects the cases I want selected.  In this case
  I will select cases from the month of apr.

SELECT IF(contdate >= 920401  & contdate <= 920430). /*apr92*/

* The following command tells the system to save the selected cases in
  a file named apr92.sav and also to save it in compressed format.

save outfile = 'd:\thesis\data\apr92.sav' /compressed.


******************************************************************************

* The following command gets the file that I want to access.


get file = 'd:\thesis\data\year92.sav' /keep marital sex race1 dobdate
  edyrs educ record afqt paddate contdate accdate term aopt gtx gm el cl
  mm sc co fa of st bopt depend box nrsid ssnfull fullmos zip fip.

* The following command ensures that any system filters, which may cause
  me to exclude cases inadvertently, are turned off.
```

FILTER OFF.

* The following command is a double check to ensure that I am including
  all cases in the specified file.

USE ALL.

* The following command selects the cases I want selected. In this case
  I will select cases from the month of may.

SELECT IF(contdate >= 920501 & contdate <= 920531). /*may92*/

* The following command tells the system to save the selected cases in
  a file named may92.sav and also to save it in compressed format.

save outfile = 'd:\thesis\data\may92.sav' /compressed.

****

* The following command gets the file that I want to access.

get file = 'd:\thesis\data\year92.sav' /keep marital sex race1 dobdate
  edyrs educ record afqt paddate contdate accdate term aopt gtx gm el cl
  mm sc co fa of st bopt depend box nrsid ssnfull fullmos zip fip.

* The following command ensures that any system filters, which may cause
  me to exclude cases inadvertently, are turned off.

FILTER OFF.

* The following command is a double check to ensure that I am including
  all cases in the specified file.

USE ALL.

* The following command selects the cases I want selected. In this case
  I will select cases from the month of jun.

SELECT IF(contdate >= 920601 & contdate <= 920630). /*jun92*/

* The following command tells the system to save the selected cases in
  a file named jun92.sav and also to save it in compressed format.

save outfile = 'd:\thesis\data\jun92.sav' /compressed.

****

* The following command gets the file that I want to access.

get file = 'd:\thesis\data\year92.sav' /keep marital sex race1 dobdate
edyrs educ record afqt paddate contdate accdate term aopt gtx gm el cl
mm sc co fa of st bopt depend box nrsid ssnfull fullmos zip fip.

* The following command ensures that any system filters, which may cause
me to exclude cases inadvertently, are turned off.

FILTER OFF.

* The following command is a double check to ensure that I am including
all cases in the specified file.

USE ALL.

* The following command selects the cases I want selected. In this case
I will select cases from the month of jul.

SELECT IF(contdate >= 920701 & contdate <= 920731). /*jul92*/

* The following command tells the system to save the selected cases in
a file named jul92.sav and also to save it in compressed format.

save outfile = 'd:\thesis\data\jul92.sav' /compressed.

****

* The following command gets the file that I want to access.

get file = 'd:\thesis\data\year92.sav' /keep marital sex race1 dobdate
edyrs educ record afqt paddate contdatc accdate term aopt gtx gm el cl
mm sc co fa of st bopt depend box nrsid ssnfull fullmos zip fip.

* The following command ensures that any system filters, which may cause
me to exclude cases inadvertently, are turned off.

FILTER OFF.

* The following command is a double check to ensure that I am including all cases in the specified file.

USE ALL.

* The following command selects the cases I want selected. In this case I will select cases from the month of aug.

SELECT IF(contdate >= 920801 & contdate <= 920831). /*aug92*/

* The following command tells the system to save the selected cases in a file named aug92.sav and also to save it in compressed format.

save outfile = 'd:\thesis\data\aug92.sav' /compressed.

****

* The following command gets the file that I want to access.

get file = 'd:\thesis\data\year92.sav' /keep marital sex race1 dobdate edyrs educ record afqt paddate contdate accdate term aopt gtx gm el cl mm sc co fa of st bopt depend box nrsid ssnfull fullmos zip fip.

* The following command ensures that any system filters, which may cause me to exclude cases inadvertently, are turned off.

FILTER OFF.

* The following command is a double check to ensure that I am including all cases in the specified file.

USE ALL.

* The following command selects the cases I want selected. In this case I will select cases from the month of sep.

SELECT IF(contdate >= 920901 & contdate <= 920930). /*sep92*/

* The following command tells the system to save the selected cases in a file named sep92.sav and also to save it in compressed format.

```
save outfile = 'd:\thesis\data\sep92.sav' /compressed.


***************************************************************************
* The following command gets the file that I want to access.

get file = 'd:\thesis\data\year92.sav' /keep marital sex race1 dobdate
  edyrs educ record afqt paddate contdate accdate term aopt gtx gm el cl
  mm sc co fa of st bopt depend box nrsid ssnfull fullmos zip fip.

* The following command ensures that any system filters, which may cause
  me to exclude cases inadvertently, are turned off.

FILTER OFF.

* The following command is a double check to ensure that I am including
  all cases in the specified file.

USE ALL.

* The following command selects the cases I want selected.  In this case
  I will select cases from the month of oct.

SELECT IF(contdate >= 921001  & contdate <= 921031). /*oct92*/

* The following command tells the system to save the selected cases in
  a file named oct92.sav and also to save it in compressed format.

save outfile = 'd:\thesis\data\oct92.sav' /compressed.


***************************************************************************
* The following command gets the file that I want to access.

get file = 'd:\thesis\data\year92.sav' /keep marital sex race1 dobdate
  edyrs educ record afqt paddate contdate accdate term aopt gtx gm el cl
  mm sc co fa of st bopt depend box nrsid ssnfull fullmos zip fip.

* The following command ensures that any system filters, which may cause
  me to exclude cases inadvertently, are turned off.

FILTER OFF.
```

* The following command is a double check to ensure that I am including
  all cases in the specified file.

USE ALL.

* The following command selects the cases I want selected. In this case
  I will select cases from the month of nov.

SELECT IF(contdate >= 921101 & contdate <= 921130). /*nov92*/

* The following command tells the system to save the selected cases in
  a file named nov92.sav and also to save it in compressed format.

save outfile = 'd:\thesis\data\nov92.sav' /compressed.

****
* The following command gets the file that I want to access.

get file = 'd:\thesis\data\year92.sav' /keep marital sex race1 dobdate
  edyrs educ record afqt paddate contdate accdate term aopt gtx gm el cl
  mm sc co fa of st bopt depend box nrsid ssnfull fullmos zip fip.

* The following command ensures that any system filters, which may cause
  me to exclude cases inadvertently, are turned off.

FILTER OFF.

* The following command is a double check to ensure that I am including
  all cases in the specified file.

USE ALL.

* The following command selects the cases I want selected. In this case
  I will select cases from the month of dec.

SELECT IF(contdate >= 921201 & contdate <= 921231). /*dec92*/

* The following command tells the system to save the selected cases in
  a file named dec92.sav and also to save it in compressed format.

save outfile = 'd:\thesis\data\dec92.sav' /compressed.

```
* This section of syntax eliminates cases of people who scored below 50% on ASVAB.

****************************************************************************
*                      1992                    *
****************************************************************************
* The following command gets the appropriate data file.

get file = 'd:\thesis\data\nmjan92.sav' /keep all.

* The following commands eliminates low quality (CAT IIIB and below) cases.

FILTER OFF.
USE ALL.
SELECT IF(afqt >= 50).

* The following command saves the results to a data file.

save outfile = 'd:\thesis\data\catjan92.sav' /keep all.

****************************************************************************
* The following command gets the appropriate data file.

get file = 'd:\thesis\data\nmfeb92.sav' /keep all.

* The following commands eliminates low quality (CAT IIIB and below) cases.

FILTER OFF.
USE ALL.
SELECT IF(afqt >= 50).

* The following command saves the results to a data file.

save outfile = 'd:\thesis\data\catfeb92.sav' /keep all.

****************************************************************************
* The following command gets the appropriate data file.

get file = 'd:\thesis\data\nmmar92.sav' /keep all.
```

```
* The following commands eliminates low quality (CAT IIIB and below) cases.

FILTER OFF.
USE ALL.
SELECT IF(afqt >= 50).

* The following command saves the results to a data file.

save outfile = 'd:\thesis\data\catmar92.sav' /keep all.


**************************************************************************
* The following command gets the appropriate data file.

get file = 'd:\thesis\data\nmapr92.sav' /keep all.

* The following commands eliminates low quality (CAT IIIB and below) cases.

FILTER OFF.
USE ALL.
SELECT IF(afqt >= 50).

* The following command saves the results to a data file.

save outfile = 'd:\thesis\data\catapr92.sav' /keep all.


**************************************************************************
* The following command gets the appropriate data file.

get file = 'd:\thesis\data\nmmay92.sav' /keep all.

* The following commands eliminates low quality (CAT IIIB and below) cases.

FILTER OFF.
USE ALL.
SELECT IF(afqt >= 50).

* The following command saves the results to a data file.

save outfile = 'd:\thesis\data\catmay92.sav' /keep all.

**************************************************************************
```

* The following command gets the appropriate data file.

get file = 'd:\thesis\data\nmjun92.sav' /keep all.

* The following commands eliminates low quality (CAT IIIB and below) cases.

FILTER OFF.
USE ALL.
SELECT IF(afqt >= 50).

* The following command saves the results to a data file.

save outfile = 'd:\thesis\data\catjun92.sav' /keep all.

****
* The following command gets the appropriate data file.

get file = 'd:\thesis\data\nmjul92.sav' /keep all.

* The following commands eliminates low quality (CAT IIIB and below) cases.

FILTER OFF.
USE ALL.
SELECT IF(afqt >= 50).

* The following command saves the results to a data file.

save outfile = 'd:\thesis\data\catjul92.sav' /keep all.

****
* The following command gets the appropriate data file.

get file = 'd:\thesis\data\nmaug92.sav' /keep all.

* The following commands eliminates low quality (CAT IIIB and below) cases.

FILTER OFF.
USE ALL.
SELECT IF(afqt >= 50).

* The following command saves the results to a data file.

```
save outfile = 'd:\thesis\data\cataug92.sav' /keep all.

************************************************************************
* The following command gets the appropriate data file.

get file = 'd:\thesis\data\nmsep92.sav' /keep all.

* The following commands eliminates low quality (CAT IIIB and below) cases.

FILTER OFF.
USE ALL.
SELECT IF(afqt >= 50).

* The following command saves the results to a data file.

save outfile = 'd:\thesis\data\catsep92.sav' /keep all.

************************************************************************
* The following command gets the appropriate data file.

get file = 'd:\thesis\data\nmoct92.sav' /keep all.


* The following commands eliminates low quality (CAT IIIB and below) cases.

FILTER OFF.
USE ALL.
SELECT IF(afqt >= 50).

* The following command saves the results to a data file.

save outfile = 'd:\thesis\data\catoct92.sav' /keep all.

************************************************************************
* The following command gets the appropriate data file.

get file = 'd:\thesis\data\nmnov92.sav' /keep all.

* The following commands eliminates low quality (CAT IIIB and below) cases.

FILTER OFF.
USE ALL.
SELECT IF(afqt >= 50).
```

```
* The following command saves the results to a data file.

save outfile = 'd:\thesis\data\catnov92.sav' /keep all.

****************************************************************************

* The following command gets the appropriate data file.

get file = 'd:\thesis\data\nmdec92.sav' /keep all.

* The following commands eliminates low quality (CAT IIIB and below) cases.

FILTER OFF.
USE ALL.
SELECT IF(afqt >= 50).

* The following command saves the results to a data file.

save outfile = 'd:\thesis\data\catdec92.sav' /keep all.


* This syntax file sums number of cases by MOS.

****************************************************************************
*                        1992                        *
****************************************************************************
*********************************jan92***********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\catjan92.sav' /keep all.

* The following command adds up the number of each mos.

FREQUENCIES
 VARIABLES=fullmos
 /STATISTICS=SUM .

*********************************feb92***********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\catfeb92.sav' /keep all.
```

```
* The following command adds up the number of each mos.

FREQUENCIES
 VARIABLES=fullmos
 /STATISTICS=SUM .

********************************mar92********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\catmar92.sav' /keep all.

* The following command adds up the number of each mos.

FREQUENCIES
 VARIABLES=fullmos
 /STATISTICS=SUM .

********************************apr92********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\catapr92.sav' /keep all.

* The following command adds up the number of each mos.

FREQUENCIES
 VARIABLES=fullmos
 /STATISTICS=SUM .

********************************may92********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\catmay92.sav' /keep all.

* The following command adds up the number of each mos.

FREQUENCIES
 VARIABLES=fullmos
 /STATISTICS=SUM .
```

```
********************************jul92**********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\catjun92.sav' /keep all.

* The following command adds up the number of each mos.

FREQUENCIES
 VARIABLES=fullmos
 /STATISTICS=SUM .

********************************jul92**********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\catjul92.sav' /keep all.


* The following command adds up the number of each mos.

FREQUENCIES
 VARIABLES=fullmos
 /STATISTICS=SUM .

********************************aug92**********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\cataug92.sav' /keep all.

* The following command adds up the number of each mos.

FREQUENCIES
 VARIABLES=fullmos
 /STATISTICS=SUM .

********************************sep92**********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\catsep92.sav' /keep all.
```

* The following command adds up the number of each mos.

```
FREQUENCIES
 VARIABLES=fullmos
 /STATISTICS=SUM .
```

********************************oct92**********************************

* The following command gets the monthly data file I want to work with.

```
get file = 'd:\thesis\data\catoct92.sav' /keep all.
```

* The following command adds up the number of each mos.

```
FREQUENCIES
 VARIABLES=fullmos
 /STATISTICS=SUM .
```

********************************nov92**********************************

* The following command gets the monthly data file I want to work with.

```
get file = 'd:\thesis\data\catnov92.sav' /keep all.
```

* The following command adds up the number of each mos.

```
FREQUENCIES
 VARIABLES=fullmos
 /STATISTICS=SUM .
```

********************************dec92**********************************

* The following command gets the monthly data file I want to work with.

```
get file = 'd:\thesis\data\catdec92.sav' /keep all.
```

* The following command adds up the number of each mos.

```
FREQUENCIES
 VARIABLES=fullmos
 /STATISTICS=SUM .
```

****** THE NEXT SECTION USES MOS 11X AS AN EXAMPLE.

```
* This syntax identifies all cases of 11B bonus takers.


*************************************************************************
*                               1992                        *
*************************************************************************
********************************** jan92*******************************

get file = 'd:\thesis\data\catjan92.sav' /keep all.

FILTER OFF.
USE ALL.
SELECT IF(fullmos = '11X1' | fullmos = '11X10' | fullmos = '11X1O').

save outfile = 'd:\thesis\data\b11jan92.sav' /keep all.

**********************************feb92********************************

get file = 'd:\thesis\data\catfeb92.sav' /keep all.

FILTER OFF.
USE ALL.
SELECT IF(fullmos = '11X1' | fullmos = '11X10' | fullmos = '11X1O').

save outfile = 'd:\thesis\data\b11feb92.sav' /keep all.

********************************** mar92 *****************************

get file = 'd:\thesis\data\catmar92.sav' /keep all.

FILTER OFF.
USE ALL.
SELECT IF(fullmos = '11X1' | fullmos = '11X10' | fullmos = '11X1O').

save outfile = 'd:\thesis\data\b11mar92.sav' /keep all.

********************************** apr92 *****************************

get file = 'd:\thesis\data\catapr92.sav' /keep all.

FILTER OFF.
USE ALL.
```

```
SELECT IF(fullmos = '11X1' | fullmos = '11X10' | fullmos = '11X1O').

save outfile = 'd:\thesis\data\b11apr92.sav' /keep all.

************************************ may92 ******************************

get file = 'd:\thesis\data\catmay92.sav' /keep all.

FILTER OFF.
USE ALL.
SELECT IF(fullmos = '11X1' | fullmos = '11X10' | fullmos = '11X1O').

save outfile = 'd:\thesis\data\b11may92.sav' /keep all.

************************************ jun92 ******************************

get file = 'd:\thesis\data\catjun92.sav' /keep all.

FILTER OFF.
USE ALL.
SELECT IF(fullmos = '11X1' | fullmos = '11X10' | fullmos = '11X1O').

save outfile = 'd:\thesis\data\b11jun92.sav' /keep all.

************************************ jul92******************************

get file = 'd:\thesis\data\catjul92.sav' /keep all.

FILTER OFF.
USE ALL.
SELECT IF(fullmos = '11X1' | fullmos = '11X10' | fullmos = '11X1O').

save outfile = 'd:\thesis\data\b11jul92.sav' /keep all.

************************************ aug92 ******************************

get file = 'd:\thesis\data\cataug92.sav' /keep all.

FILTER OFF.
USE ALL.
SELECT IF(fullmos = '11X1' | fullmos = '11X10' | fullmos = '11X1O').

save outfile = 'd:\thesis\data\b11aug92.sav' /keep all.
```

```
************************************ sep92 ******************************

get file = 'd:\thesis\data\catsep92.sav' /keep all.

FILTER OFF.
USE ALL.
SELECT IF(fullmos = '11X1' | fullmos = '11X10' | fullmos = '11X1O').

save outfile = 'd:\thesis\data\b11sep92.sav' /keep all.

************************************ oct92 ******************************

get file = 'd:\thesis\data\catoct92.sav' /keep all.

FILTER OFF.
USE ALL.
SELECT IF(fullmos = '11X1' | fullmos = '11X10' | fullmos = '11X1O').

save outfile = 'd:\thesis\data\b11oct92.sav' /keep all.

************************************ nov92 ******************************

get file = 'd:\thesis\data\catnov92.sav' /keep all.

FILTER OFF.
USE ALL.
SELECT IF(fullmos = '11X1' | fullmos = '11X10' | fullmos = '11X1O').

save outfile = 'd:\thesis\data\b11nov92.sav' /keep all.

************************************ dec92 ******************************

get file = 'd:\thesis\data\catdec92.sav' /keep all.

FILTER OFF.
USE ALL.
SELECT IF(fullmos = '11X1' | fullmos = '11X10' | fullmos = '11X1O').

save outfile = 'd:\thesis\data\b11dec92.sav' /keep all.


* This syntax file assigns 'bonus' or 'acf' to incent variable.
```

```
**************************************************************************
*                    1992                    *
**************************************************************************

*******************************jan92*********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\11Xjan92.sav' /keep all.


* The following command assigns incentive type to incent variable.

STRING INCENT (A8).
IF (aopt='17'|aopt='173'|aopt='174'|aopt='175'|aopt='176') INCENT = 'BONUS' .

IF (aopt='28'|aopt=' 28'|aopt='283') INCENT = 'ACF' .
VARIABLE LABELS INCENT 'Incentive Taken' .

save outfile =  'd:\thesis\data\11Xjan92.sav' /keep all.

*******************************feb92*********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\11Xfeb92.sav' /keep all.

* The following command assigns incentive type to incent variable.

STRING INCENT (A8).
IF (aopt='17'|aopt='173'|aopt='174'|aopt='175'|aopt='176') INCENT = 'BONUS' .

IF (aopt='28'|aopt=' 28'|aopt='283') INCENT = 'ACF' .
VARIABLE LABELS INCENT 'Incentive Taken' .

save outfile =  'd:\thesis\data\11Xfeb92.sav' /keep all.

*******************************mar92*********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\11Xmar92.sav' /keep all.
```

```
* The following command assigns incentive type to incent variable.

STRING INCENT (A8).
IF (aopt='17'|aopt='173'|aopt='174'|aopt='175'|aopt='176') INCENT = 'BONUS' .

IF (aopt='28'|aopt=' 28'|aopt='283') INCENT = 'ACF' .
VARIABLE LABELS INCENT 'Incentive Taken' .

save outfile =  'd:\thesis\data\11Xmar92.sav' /keep all.

********************************apr92*********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\11Xapr92.sav' /keep all.

* The following command assigns incentive type to incent variable.

STRING INCENT (A8).
IF (aopt='17'|aopt='173'|aopt='174'|aopt='175'|aopt='176') INCENT = 'BONUS' .

IF (aopt='28'|aopt=' 28'|aopt='283') INCENT = 'ACF' .
VARIABLE LABELS INCENT 'Incentive Taken' .

save outfile =  'd:\thesis\data\11Xapr92.sav' /keep all.

********************************may92*********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\11Xmay92.sav' /keep all.

* The following command assigns incentive type to incent variable.

STRING INCENT (A8).
IF (aopt='17'|aopt='173'|aopt='174'|aopt='175'|aopt='176') INCENT = 'BONUS' .

IF (aopt='28'|aopt=' 28'|aopt='283') INCENT = 'ACF' .
VARIABLE LABELS INCENT 'Incentive Taken' .

save outfile =  'd:\thesis\data\11Xmay92.sav' /keep all.

*********************************jun92*********************************
```

```
* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\11Xjun92.sav' /keep all.

* The following command assigns incentive type to incent variable.

STRING INCENT (A8).
IF (aopt='17'|aopt='173'|aopt='174'|aopt='175'|aopt='176') INCENT = 'BONUS' .


IF (aopt='28'|aopt=' 28'|aopt='283') INCENT = 'ACF' .
VARIABLE LABELS INCENT 'Incentive Taken' .

save outfile =  'd:\thesis\data\11Xjun92.sav' /keep all.

********************************jul92**********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\11Xjul92.sav' /keep all.

* The following command assigns incentive type to incent variable.

STRING INCENT (A8).
IF (aopt='17'|aopt='173'|aopt='174'|aopt='175'|aopt='176') INCENT = 'BONUS' .

IF (aopt='28'|aopt=' 28'|aopt='283') INCENT = 'ACF' .
VARIABLE LABELS INCENT 'Incentive Taken' .

save outfile =  'd:\thesis\data\11Xjul92.sav' /keep all.

********************************aug92**********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\11Xaug92.sav' /keep all.

* The following command assigns incentive type to incent variable.

STRING INCENT (A8).
IF (aopt='17'|aopt='173'|aopt='174'|aopt='175'|aopt='176') INCENT = 'BONUS' .

IF (aopt='28'|aopt=' 28'|aopt='283') INCENT = 'ACF' .
```

```
VARIABLE LABELS INCENT 'Incentive Taken' .

save outfile =  'd:\thesis\data\11Xaug92.sav' /keep all.

*****************  ***************sep92**********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\11Xsep92.sav' /keep all.


* The following command assigns incentive type to incent variable.

STRING INCENT (A8).
IF (aopt='17'|aopt='173'|aopt='174'|aopt='175'|aopt='176') INCENT = 'BONUS' .

IF (aopt='28'|aopt=' 28'|aopt='283') INCENT = 'ACF' .
VARIABLE LABELS INCENT 'Incentive Taken' .

save outfile =  'd:\thesis\data\11Xsep92.sav' /keep all.

********************************oct92**********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\11Xoct92.sav' /keep all.

* The following command assigns incentive type to incent variable.

STRING INCENT (A8).
IF (aopt='17'|aopt='173'|aopt='174'|aopt='175'|aopt='176') INCENT = 'BONUS' .

IF (aopt='28'|aopt=' 28'|aopt='283') INCENT = 'ACF' .
VARIABLE LABELS INCENT 'Incentive Taken' .

save outfile =  'd:\thesis\data\11Xoct92.sav' /keep all.

********************************nov92**********************************
* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\11Xnov92.sav' /keep all.

* The following command assigns incentive type to incent variable.
```

```
STRING INCENT (A8).
IF (aopt='17'|aopt='173'|aopt='174'|aopt='175'|aopt='176') INCENT = 'BONUS' .

IF (aopt='28'|aopt=' 28'|aopt='283') INCENT = 'ACF' .
VARIABLE LABELS INCENT 'Incentive Taken' .

save outfile = 'd:\thesis\data\11Xnov92.sav' /keep all.


********************************dec92*********************************

* The following command gets the monthly data file I want to work with.

get file = 'd:\thesis\data\11Xdec92.sav' /keep all.

* The following command assigns incentive type to incent variable.

STRING INCENT (A8).
IF (aopt='17'|aopt='173'|aopt='174'|aopt='175'|aopt='176') INCENT = 'BONUS' .

IF (aopt='28'|aopt=' 28'|aopt='283') INCENT = 'ACF' .
VARIABLE LABELS INCENT 'Incentive Taken' .

save outfile = 'd:\thesis\data\11Xdec92.sav' /keep all.


**********************************************************************
**********************************************************************
* AT THIS POINT, YOU NEED TO MANUALLY CREATE DATA FILES, SUCH AS
* THE ONE SHOWN IN APPENDIX B. THE REMAINED OF SYNTAX REFERS TO
* INDIVIDUAL DATA FILES. NAMING CONVENTION IS <3-DIGIT MOS>
<MONTH><YEAR>.SAV.
**********************************************************************
**********************************************************************
```

Appendix B: Sample Data Set

The data set shown on the following pages were built manually following completion of data sorting. The data sorting syntax is shown in Appendix A . The example data is that of the 19K1 -- M-1 Armor Crewmember military occupational specialty.

	period	month	y	y2	y3	x1	x2	x3
1	1	oct87	4	0	0	2.50	5.90	0
2	2	nov87	1	0	0	2.50	5.70	0
3	3	dec87	4	0	0	2.50	5.70	0
4	4	jan88	5	0	0	2.50	5.60	0
5	5	feb88	5	0	0	3.50	5.50	0
6	6	mar88	6	0	0	3.50	5.40	0
7	7	apr88	4	0	0	3.50	5.50	0
8	8	may88	4	0	0	3.50	5.20	0
9	9	jun88	4	0	0	3.50	5.40	0
10	10	jul88	5	0	0	3.50	5.50	0
11	11	aug88	4	0	0	3.50	5.30	0
12	12	sep88	5	0	0	3.50	5.20	0
13	13	oct88	6	0	0	3.50	5.30	0
14	14	nov88	4	.	.	3.50	5.30	0
15	15	dec88	5	0	0	3.50	5.40	0
16	16	jan89	9	0	0	3.50	5.10	0
17	17	feb89	4	0	0	3.50	5.20	0
18	18	mar89	7	0	0	3.50	5.30	0
19	19	apr89	7	0	0	3.50	5.20	0
20	20	may89	3	0	0	3.50	5.30	0
21	21	jun89	8	0	0	3.50	5.20	0
22	22	jul89	2	0	0	3.50	5.20	0
23	23	aug89	4	0	0	3.50	5.30	0
24	24	sep89	12	0	0	3.50	5.30	0
25	25	oct89	2	2	6	4.00	5.40	0
26	26	nov89	2	0	4	4.00	5.40	0
27	27	dec89	6	1	4	4.00	5.40	0
28	28	jan90	5	0	3	4.00	5.40	0
29	29	feb90	2	1	4	2.50	5.20	0
30	30	mar90	5	0	34	2.50	5.40	0
31	31	apr90	5	1	18	2.50	5.30	0
32	32	may90	11	4	39	2.50	5.20	0

	x4	x1square	x2square	x1x2	x1x3	x1x4	x2x3	x2x4
1	1	6.25	34.81	14.75	.00	2.50	.00	5.90
2	1	6.25	32.49	14.25	.00	2.50	.00	5.70
3	1	6.25	32.49	14.25	.00	2.50	.00	5.70
4	1	6.25	31.36	14.00	.00	2.50	.00	5.60
5	1	12.25	30.25	19.25	.00	3.50	.00	5.50
6	1	12.25	29.16	18.90	.00	3.50	.00	5.40
7	1	12.25	30.25	19.25	.00	3.50	.00	5.50
8	1	12.25	27.04	18.20	.00	3.50	.00	5.20
9	1	12.25	29.16	18.90	.00	3.50	.00	5.40
10	1	12.25	30.25	19.25	.00	3.50	.00	5.50
11	1	12.25	28.09	18.55	.00	3.50	.00	5.30
12	1	12.25	27.04	18.20	.00	3.50	.00	5.20
13	1	12.25	28.09	18.55	.00	3.50	.00	5.30
14	1	12.25	28.09	18.55	.00	3.50	.00	5.30
15	1	12.25	29.16	18.90	.00	3.50	.00	5.40
16	1	12.25	26.01	17.85	.00	3.50	.00	5.10
17	1	12.25	27.04	18.20	.00	3.50	.00	5.20
18	1	12.25	28.09	18.55	.00	3.50	.00	5.30
19	1	12.25	27.04	18.20	.00	3.50	.00	5.20
20	1	12.25	28.09	18.55	.00	3.50	.00	5.30
21	1	12.25	27.04	18.20	.00	3.50	.00	5.20
22	1	12.25	27.04	18.20	.00	3.50	.00	5.20
23	1	12.25	28.09	18.55	.00	3.50	.00	5.30
24	1	12.25	28.09	18.55	.00	3.50	.00	5.30
25	1	16.00	29.16	21.60	.00	4.00	.00	5.40
26	1	16.00	29.16	21.60	.00	4.00	.00	5.40
27	1	16.00	29.16	21.60	.00	4.00	.00	5.40
28	1	16.00	29.16	21.60	.00	4.00	.00	5.40
29	1	6.25	27.04	13.00	.00	2.50	.00	5.20
30	1	6.25	29.16	13.50	.00	2.50	.00	5.40
31	1	6.25	28.09	13.25	.00	2.50	.00	5.30
32	1	6.25	27.04	13.00	.00	2.50	.00	5.20

	x3x4	total	x5	x1x5	x2x5	x3x5	x4x5
1	.00	4.00	0	.00	.00	.00	.00
2	.00	1.00	0	.00	.00	.00	.00
3	.00	4.00	0	.00	.00	.00	.00
4	.00	5.00	0	.00	.00	.00	.00
5	.00	5.00	0	.00	.00	.00	.00
6	.00	6.00	0	.00	.00	.00	.00
7	.00	4.00	0	.00	.00	.00	.00
8	.00	4.00	0	.00	.00	.00	.00
9	.00	4.00	0	.00	.00	.00	.00
10	.00	5.00	0	.00	.00	.00	.00
11	.00	4.00	0	.00	.00	.00	.00
12	.00	5.00	0	.00	.00	.00	.00
13	.00	6.00	0	.00	.00	.00	.00
14	.00	.	0	.00	.00	.00	.00
15	.00	5.00	0	.00	.00	.00	.00
16	.00	9.00	0	.00	.00	.00	.00
17	.00	4.00	0	.00	.00	.00	.00
18	.00	7.00	0	.00	.00	.00	.00
19	.00	7.00	0	.00	.00	.00	.00
20	.00	3.00	0	.00	.00	.00	.00
21	.00	8.00	0	.00	.00	.00	.00
22	.00	2.00	0	.00	.00	.00	.00
23	.00	4.00	0	.00	.00	.00	.00
24	.00	12.00	0	.00	.00	.00	.00
25	.00	10.00	0	.00	.00	.00	.00
26	.00	6.00	0	.00	.00	.00	.00
27	.00	11.00	0	.00	.00	.00	.00
28	.00	8.00	0	.00	.00	.00	.00
29	.00	7.00	0	.00	.00	.00	.00
30	.00	39.00	0	.00	.00	.00	.00
31	.00	24.00	0	.00	.00	.00	.00
32	.00	54.00	0	.00	.00	.00	.00

	period	month	y	y2	y3	x1	x2	x3
33	33	jun90	11	10	56	2.50	5.50	0
34	34	jul90	24	39	190	3.50	5.60	0
35	35	aug90	22	38	174	3.50	5.70	1
36	36	sep90	28	31	105	3.50	5.70	1
37	37	oct90	46	35	65	4.00	5.90	1
38	38	nov90	67	35	96	4.00	6.00	1
39	39	dec90	81	63	109	4.00	6.10	1
40	40	jan91	27	110	106	3.00	6.40	1
41	41	feb91	27	99	81	3.00	6.80	1
42	42	mar91	20	73	134	3.00	6.50	1
43	43	apr91	20	28	104	3.00	6.80	1
44	44	may91	6	9	28	3.00	6.90	1
45	45	jun91	3	17	37	3.00	6.70	1
46	46	jul91	13	5	116	3.00	6.70	0
47	47	aug91	15	34	196	3.00	6.60	0
48	48	sep91	26	50	232	3.00	6.70	0
49	49	oct91	16	16	138	3.00	6.90	0
50	50	nov91	2	1	6	3.00	7.10	0
51	51	dec91	1	0	4	3.00	7.10	0
52	52	jan92	3	8	42	3.00	7.30	0
53	53	feb92	3	4	22	3.00	7.30	0
54	54	mar92	14	21	96	3.00	7.20	0
55	55	apr92	6	4	13	3.00	7.50	0
56	56	may92	11	3	21	3.00	7.80	0
57	57	jun92	11	14	41	3.00	7.70	0
58	58	jul92	16	23	97	3.00	7.60	0
59	59	aug92	34	17	36	3.50	7.50	0
60	60	sep92	31	35	101	3.50	7.40	0
61	61	oct92	35	17	71	3.50	7.20	0
62	62	nov92	30	15	44	3.50	7.30	1
63	63	dec92	14	21	45	3.50	7.20	1
64	64	jan93	16	7	32	3.50	7.10	1

	x4	x1square	x2square	x1x2	x1x3	x1x4	x2x3	x2x4
33	1	6.25	30.25	13.75	.00	2.50	.00	5.50
34	1	12.25	31.36	19.60	.00	3.50	.00	5.60
35	1	12.25	32.49	19.95	3.50	3.50	5.70	5.70
36	1	12.25	32.49	19.95	3.50	3.50	5.70	5.70
37	1	16.00	34.81	23.60	4.00	4.00	5.90	5.90
38	1	16.00	36.00	24.00	4.00	4.00	6.00	6.00
39	1	16.00	37.21	24.40	4.00	4.00	6.10	6.10
40	1	9.00	40.96	19.20	3.00	3.00	6.40	6.40
41	1	9.00	46.24	20.40	3.00	3.00	6.80	6.80
42	1	9.00	42.25	19.50	3.00	3.00	6.50	6.50
43	1	9.00	46.24	20.40	3.00	3.00	6.80	6.80
44	1	9.00	47.61	20.70	3.00	3.00	6.90	6.90
45	1	9.00	44.89	20.10	3.00	3.00	6.70	6.70
46	1	9.00	44.89	20.10	.00	3.00	.00	6.70
47	1	9.00	43.56	19.80	.00	3.00	.00	6.60
48	1	9.00	44.89	20.10	.00	3.00	.00	6.70
49	1	9.00	47.61	20.70	.00	3.00	.00	6.90
50	1	9.00	50.41	21.30	.00	3.00	.00	7.10
51	1	9.00	50.41	21.30	.00	3.00	.00	7.10
52	1	9.00	53.29	21.90	.00	3.00	.00	7.30
53	1	9.00	53.29	21.90	.00	3.00	.00	7.30
54	1	9.00	51.84	21.60	.00	3.00	.00	7.20
55	1	9.00	56.25	22.50	.00	3.00	.00	7.50
56	1	9.00	60.84	23.40	.00	3.00	.00	7.80
57	1	9.00	59.29	23.10	.00	3.00	.00	7.70
58	1	9.00	57.76	22.80	.00	3.00	.00	7.60
59	1	12.25	56.25	26.25	.00	3.50	.00	7.50
60	1	12.25	54.76	25.90	.00	3.50	.00	7.40
61	1	12.25	51.84	25.20	.00	3.50	.00	7.20
62	1	12.25	53.29	25.55	3.50	3.50	7.30	7.30
63	1	12.25	51.84	25.20	3.50	3.50	7.20	7.20
64	1	12.25	50.41	24.85	3.50	3.50	7.10	7.10

	x3x4	total	x5	x1x5	x2x5	x3x5	x4x5
33	.00	77.00	0	.00	.00	.00	.00
34	.00	253.00	0	.00	.00	.00	.00
35	1.00	234.00	0	.00	.00	.00	.00
36	1.00	164.00	0	.00	.00	.00	.00
37	1.00	146.00	0	.00	.00	.00	.00
38	1.00	198.00	0	.00	.00	.00	.00
39	1.00	253.00	0	.00	.00	.00	.00
40	1.00	243.00	0	.00	.00	.00	.00
41	1.00	207.00	0	.00	.00	.00	.00
42	1.00	227.00	0	.00	.00	.00	.00
43	1.00	152.00	0	.00	.00	.00	.00
44	1.00	43.00	0	.00	.00	.00	.00
45	1.00	57.00	0	.00	.00	.00	.00
46	.00	134.00	0	.00	.00	.00	.00
47	.00	245.00	0	.00	.00	.00	.00
48	.00	308.00	0	.00	.00	.00	.00
49	.00	170.00	0	.00	.00	.00	.00
50	.00	9.00	0	.00	.00	.00	.00
51	.00	5.00	0	.00	.00	.00	.00
52	.00	53.00	0	.00	.00	.00	.00
53	.00	29.00	0	.00	.00	.00	.00
54	.00	131.00	0	.00	.00	.00	.00
55	.00	23.00	0	.00	.00	.00	.00
56	.00	35.00	0	.00	.00	.00	.00
57	.00	66.00	0	.00	.00	.00	.00
58	.00	136.00	0	.00	.00	.00	.00
59	.00	87.00	0	.00	.00	.00	.00
60	.00	167.00	0	.00	.00	.00	.00
61	.00	123.00	0	.00	.00	.00	.00
62	1.00	89.00	0	.00	.00	.00	[illegible]
63	1.00	80.00	0	.00	.00	.00	.00
64	1.00	55.00	0	.00	.00	.00	.00

e:\models\19k1\model.sav

	period	month	y	y2	y3	x1	x2	x3
65	65	feb93	16	6	29	3.50	6.80	1
66	66	mar93	45	29	101	3.50	6.40	1
67	67	apr93	11	34	116	3.50	6.40	1
68	68	may93	8	37	192	3.50	6.70	
69	69	jun93	10	40	123	3.50	6.40	
70	70	jul93	15	20	136	3.50	6.40	1

	x4	x1square	x2square	x1x2	x1x3	x1x4	x2x3	x2x4
65	1	12.25	46.24	23.80	3.50	3.50	6.80	6.80
66	1	12.25	40.96	22.40	3.50	3.50	6.40	6.40
67	0	12.25	40.96	22.40	3.50	.00	6.40	.00
68	0	12.25	44.89	23.45	3.50	.00	6.70	.00
69	0	12.25	40.96	22.40	3.50	.00	6.40	.00
70	0	12.25	40.96	22.40	3.50	.00	6.40	.00

	x3x4	total	x5	x1x5	x2x5	x3x5	x4x5
65	1.00	51.00	0	.00	.00	.00	.00
66	1.00	175.00	0	.00	.00	.00	.00
67	.00	161.00	1	3.50	6.40	1.00	.00
68	.00	237.00	1	3.50	6.70	1.00	.00
69	.00	173.00	1	3.50	6.40	1.00	.00
70	.00	171.00	1	3.50	6.40	1.00	.00

Appendix C: SPSS Syntax for Step-Wise Procedure

* This section of syntax runs stepwise procedure on number of enlistment bonus takers.

```
REGRESSION
 /DESCRIPTIVES MEAN STDDEV CORR SIG N
 /MISSING LISTWISE
 /STATISTICS COEFF OUTS CI BCOV R ANOVA END COLLIN TOL
 /CRITERIA=PIN(.05) POUT(.10)
 /NOORIGIN
 /DEPENDENT y2
 /METHOD=STEPWISE x1 x1square x1x2 x1x3 x1x4 x1x5 x2 x2square x2x3 x2x4
 x2x5 x3 x3x4 x3x5 x4  x4x5 x5
 /RESIDUALS DURBIN .
```

* This section of syntax runs stepwise procedure on number of Army College Fund takers.

```
REGRESSION
 /DESCRIPTIVES MEAN STDDEV CORR SIG N
 /MISSING LISTWISE
 /STATISTICS COEFF OUTS CI BCOV R ANOVA END COLLIN TOL
 /CRITERIA=PIN(.05) POUT(.10)
 /NOORIGIN
 /DEPENDENT y3
 /METHOD=STEPWISE x1 x1square x1x2 x1x3 x1x4 x1x5 x2 x2square x2x3 x2x4
 x2x5 x3 x3x4 x3x5 x4  x4x5 x5
 /RESIDUALS DURBIN .
```

* This section of syntax runs stepwise procedure on total number
of contracts.

```
REGRESSION
 /DESCRIPTIVES MEAN STDDEV CORR SIG N
 /MISSING LISTWISE
 /STATISTICS COEFF OUTS CI BCOV R ANOVA END COLLIN TOL
 /CRITERIA=PIN(.05) POUT(.10)
 /NOORIGIN
 /DEPENDENT total
 /METHOD=STEPWISE x1 x1square x1x2 x1x3 x1x4 x1x5 x2 x2square x2x3 x2x4
 x2x5 x3 x3x4 x3x5 x4  x4x5 x5
 /RESIDUALS DURBIN .
```

Bibliography

1. Box, George E. P. and Norman R. Draper. Empirical Model-Building and Response Surfaces. New York: John Wiley & Sons, 1987.

2. Cain, Joseph P. Class lecture, OPER 531, Economic Theory I, School of Engineering, Air Force Institute of Technology, Wright-Patterson AFB OH, August 1992.

3. Elig, Timothy W., Richard M. Johnson, Paul A. Gade, and Allyn Hertzbach. The Army Enlistment Decision: An Overview of the ARI Recruit Surveys, 1982 and 1983. Alexandria VA: U.S. Army Research Institue for the Behavioral and Social Sciences, June 1984 (2Q263731A791).

4. Gray, Rosanna L. Influences of High Quality Army Enlistments. MS thesis. School of Administrative Sciences, Naval Postgraduate School, Monterey CA, March 1987.

5. Goldberg, Lawrence, Peter Greenston, and Sherry Andrews. Time-Series Analysis of the Effects ofEducational Benefit Programs, Army Enlistment Bonuses, and the Army Delinking Factor. Contract F49642-84-D0037/5014. Reston VA: Economic Research Laboratory, Inc., November 1986.

6. Hershberger, John. Senior Analyst, Program Analysis and Evaluation Directorate, U.S. Army Recruiting Command, Fort Knox KY. 17 June 1993.

7. Jorgensen, John F. and William R. Ross. Status Report: Economic Conditions and Their Effect on the Volunteer Army. Carlisle Barracks PA: U.S. army War College, May 1984.

8. Kaplan, Robert L. and Patricia T. Harris. The Measurement of High School Students' Attitudes Toward Recruiting Incentives. Contract DAKF15-82-C-0132. McLean VA: Rumson Corporation, May 1983.

9. Kmenta, Jan. Elements of Econometrics. New York: Macmillan Publishing Co., Inc., 1971.

10. Minadeo, Gary A., U.S. Army Recruiting Command. "Army Recruiting: Changing for the 21st Century". Address to Military Operations Reserach Society members. Air Force Institute of Technology, Wright-Patterson AFB OH 23 June 1993.

11. Morey, Richard C., C.A. Knox Lovell, Lisa Wood, Varsha P. Rao, and Donna Roberts. The Optimal Allocation of Army Enlistment Incentives by MOS: Analysis of CY 86-87 Experience, Impacts of Nonmonetary Guidance Counselor Incentives, and PC Software. Contract DAFK-15-87-D-0144. Cincinnati OH: Richard C. Morey Consultants, May 1989.

12. Morey, Richard C., C.A. Knox Lovell, and Lisa Wood. Improving the Allocation of Monetary and Nonmonetary Army Enlistment Incentives by MOS: Validation Efforts Using Quarters Jan - Jun 1988, Updating of Parameter Estimates, and Updating of Projections. Contract DAFK-15-87-D-0144. Cincinnati OH: Richard C. Morey Consultants, September 1989 (RCMI-89-001).

13. Morey, Richard C. and C.A. Knox Lovell. A Prototype Model for Allocating Army Enlistment Incentives: A Feasibility Phase. Contract DAAG29-81-D-0100. Research Triangle Park NC: Battelle Columbus Laboratories, February 1986 (1988).

14. Mossbarger, David. Enlisted Accessions Division, Office of the Deputy Chief of Staff for Personnel, Washington, D.C. 22 November 1993.

15. Neter, John and others. Applied Linear Statistical Models. Boston: Richard D. Iwvin, 1990.

16. Nicholson, Walter. Microeconomic Theory. Chicago: The Dryden Press, 1989.

17. Norusis, Marija J. SPSS for Windows Base System User's Guide Release 6.0. Chicago: SPSS Inc., 1993.

18. Pliske, Rebecca M., Timothy W. Elig, and Richard M. Johnson. Towards an Understanding of Army Enlistment Motivation Patterns. Alexandria VA: U.S. Army Research Institue for the Behavioral and Social Sciences, Januaryy 1986 (2Q162722A791).

19. Sanborn, Scott. Analyst, Program Analysis and Evaluation Division, U.S. Army Recruiting Command, Fort Knox KY. 17 June 1993.

20. Schmitz, Edward J. The Army College Fund and Military Manpower: A Review of Existing Research. Alexandria VA: U.S. Army Research Institute for the Behavioral and Social Sciences, August 1990 (ARI 1572).

21. Simpson, Robert. Recruiter, U.S. Army Recruiting Station, Kettering, OH. 25 January 1994.

22. Smith, D. Alton, Paul Hogan, and Lawrence Goldberg. Army College Fund Cost-Effectiveness Study. Contract DAKF15-87-D-0144. Arlington VA: Systems Reserach and Applications Corporation, November 1990.

23. Thomas, James R. "The Cost Effectiveness of Quality Recruits: A Great Investment of the American People's Tax Dollars". Presented to Operations Research Society of America National Conference. Phoenix, AZ 3 November 1993.

24. United States Congress. Pay and Allowances of the Uniformed Services. Public Law No. 101-650, 102d Congress, 1st Session. Washington: GPO, 1991.

25. United States Congress. Veterans' Benefits. Title 38, U.S. Code , 102d Congress, 2d Session. Washington: GPO, 1992.

Vita

Captain Chester A. Char was born on June 29, 1962 in Honolulu, Hawaii. In 1980, he graduated from Kamehameha High School and attended the United States Military Academy. In 1984, he graduated from West Point with a Bachelor of Science degree. He was initially assigned to 1st Battalion, 14th Infantry at Schofield Barracks, Hawaii. While stationed in Hawaii, he served as a rifle platoon leader, company executive officer, assistant operations officer, and battalion adjutant. He was then assigned to the 101st Airborne Division (Air Assault) at Fort Campbell, Kentucky. There he served as an assistant brigade operations officer and later commanded Company A, 1st Battalion, 502d Infantry. He entered the School of Engineering, Air Force Institute of Technology in August of 1992. He is married to the former Liane W.S. Chinn. They have a son, Chelstan, and a daughter, Chelia.

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